AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

The Goubert Feed-water Heater and Purifier.

Among recent improvements in this class of apparatus, the Exhaust Steam Feed-water Heater and Purifier we illustrate on this page deserves notice, as being, apparently, the result of a careful study of the principles involved.

Among the features which will command notice are the following:

The accessibility of all parts for cleaning or repairs without disturbing the connections. The means provided for obtaining a positive and continuous circulation of water over the heating surface. The introducing of the feed into the center of the apparatus, thus causing the water to be uniformly distributed in its flow over all the heating surfaces. The facilities for the separation and settling of sediment, and the back-pressure relief valves which are intended to prevent back-pressure on the engine.

By reference to the accompanying illustration, the construction of the apparatus will be readily understood. The tubes of seamless drawn brass, are expanded at each end into the cast-iron steam chambers. The lower steam chamber is stationary, but the upper one is free to move up or down as the tubes expand or contract. These chambers being annular in shape and the tubes set in concentric rows, a large cylindrical space is left in the center of the heater, and into this hangs a cylindrical shield or apron made of sheet brass and serving to promote circulation. In the center of the lower chamber is a large mud well for the separation and settling of sediment. The annular steam space is divided on each side by a partition, in which is provided a hole closed by a flap valve, which, when open, forms a direct communication between the steam inlet and outlet.

The cold water inlet pipe projects through the top of the shell, downwards into the central circulation space; and the hot water outlet, although near the top of the heater, is sufficiently low to allow a considerable quantity of scum to accumulate in the intervals of blowing off without its being driven with the hot water into the boiler.

The exhaust steam from the engine is admitted through the nozzle on one side of the base casting, and flowing upward through one half of the heating tubes to the upper steam chamber, returns through the other half of the tubes and passes out of the opposite nozzle.

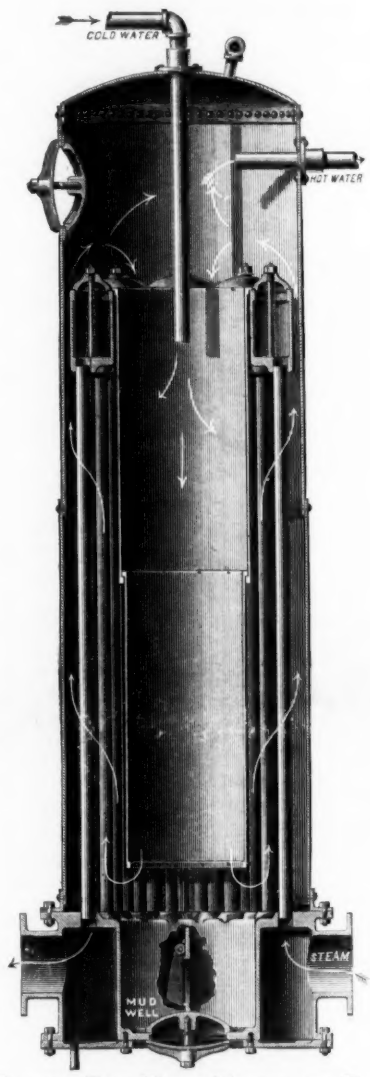
As but a small proportion of the steam is condensed in heating the feed-water, often less than one sixth, a large quantity passes out of the tubes and the internal temperature is practically the same all over. If the external temperature of all the tubes be also equalized, they will all expand equally and uniformly. The cold water, admitted from the top, flows downwards through the central channel and passing under the lower edge of the cylindrical shield, arrives at all the tubes at the same time, and as it becomes heated travels upwards and passes into the upper part of the apparatus through the annular passage left between the upper steam chamber and the shell.

From thence, a portion goes to the boiler, while the rest, leaving its scum to ascend to the top, mixes with the incoming cold water and goes down again to repeat the operation.

As the water passes under the shield at the bottom, heavy particles of sediment are projected into the still water of the mud well, and there quietly separate and settle, to be periodically blown off through a suitable pipe.

In the large-size heaters, such as shown in the engraving, a man can enter through the lower man-hole, and raising the shield, which telescopes, can clean every part of the tubes with a scraper. The interior of the tubes can also be cleaned of any accumulations of grease by removing the hand-hole plates on the top of the upper steam chamber, so that the whole apparatus can always be kept at its full efficiency.

The back pressure relief valve in the lower steam chamber is a feature peculiar to this heater and is claimed to be a positive prevention of back pressure on the engine, being so loaded that should the pressure of the exhaust increase, the valve opens and a portion of the steam passes directly to the outlet without going through the tubes.



THE GOUBERT FEED-WATER HEATER AND PURIFIER.

This heater is manufactured by the Goubert Manufacturing Co., 5 Beekman street, New York.

Automatic Knife Grinder.

This is a strong and apparently well proportioned machine for grinding knives used on planing machines, trimming machines, tobacco shears, etc.

The automatic cross-feed, it is claimed, can be adjusted so precisely as to grind one six-thousandth part of an inch at every traverse of the carriage, and as much more as desired. It is so arranged that it can be set to stop feeding and grinding at any point, hence when properly adjusted and set in motion no attendant is required. Both ends of the knife are advanced or fed forward equally at the same time, an advantage attained by the automatic cross-feed.

There is a graduated dial at the end of the knife-bar, so that the bar can be quickly set and knives ground to the same degree or bevel as when previously ground. The knife can be set with edge up or down to grind to or from the edge as may be desired. Cone pulleys on feed shaft regulate the carriage to any desired speed.

The emery wheel, 26x1½ inches, is held in a swinging frame easily adjusted by a forward movement to the wearing away of the wheel, and cone pulleys increase the speed correspondingly.

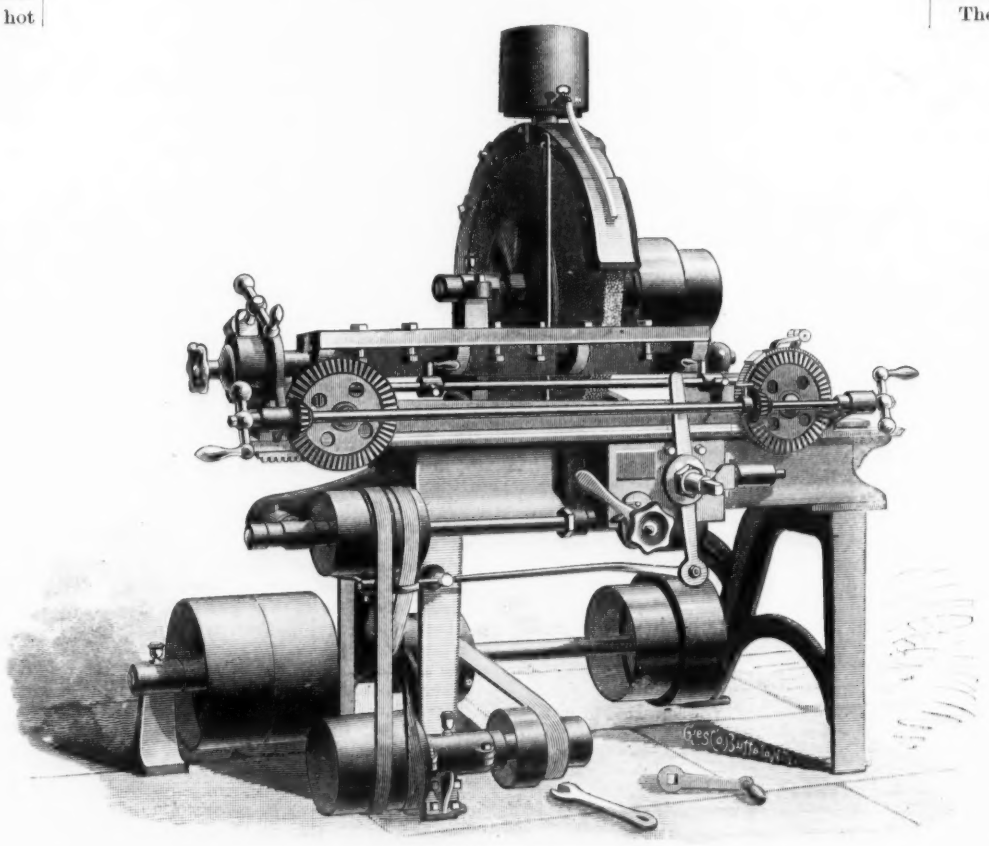
A metallic hood nearly surrounds the wheel, which prevents the water flying and is adjustable to the wearing away of the wheel. This hood has a reservoir on top from which water is supplied to the wheel, which prevents heating and drawing temper of knife, and provides for grinding straight, which cannot be done if the knife is not kept cool.

A galvanized iron pan on the carriage catches the water, and conducts it through a central opening on the back side to a trough cast on the back of the bed w[illegible]e a pipe can be connected to conduct the water away. A centrifugal pump is attached when desired, to furnish a supply of water for the wheel from a tank below it, so using repeatedly the same water. This is recommended whenever running water is not easily furnished for the reservoir.

The hood over the wheel and the galvanized iron pan on the carriage catches the water and carries it away or to the tank. When the pump or running water is used, the wheel can safely be run one-third faster and do that much more work, a fact worthy of notice.

The tight and loose pulleys on countershaft are 12 inches in diameter by 5-inch face, and should run from 315 to 400 revolutions per minute.

The carriage can be instantly stopped by dropping the worm out of the gear without shipping any belts, or stopping the wheel; this is a convenience in putting on and taking off knives. The worm and gear, to prevent wear, are run in a box filled with oil. The machine can be run with cup-shaped or tub wheels for grinding flat surfaces not too wide, and for grinding knives on a bevel not concave. Special attachments for a large variety of work have been made, such as for grinding rotary shears, chilled and steel rolls of small size, surfacing hard dies, etc. This machine is built by the Springfield Glue and Emery Wheel Company, Springfield, Mass.



AUTOMATIC KNIFE GRINDER.

The most recent plan for rapid transit in New York is a four-track railway under Broadway and Eighth Avenue from the Battery to Harlem River, the cars to be operated by electricity. The plan looks feasible, if it can be demonstrated that electricity will be satisfactory as a motive power. Any tunnel under the streets named for the purpose should cover room for sewers, electric wires, etc.

Condition and Prospects of the Machinery Business.

LETTERS FROM LEADING MANUFACTURERS TO THE "AMERICAN MACHINIST."

The Yale & Towne Manufacturing Co., Stamford, Conn., write us:

It gives us much pleasure to say that to us the outlook for business is more promising than it has been for several years past.

Our sales of locks and hardware have been greater than ever before during the past year, and inquiry in this branch of our business is still more active at present.

In the other branches of our business, with which your readers are more directly concerned, namely: Our cranes and hoisting machinery, a decided improvement is manifest; and, as this business depends so directly on the general state of the iron trade and the railroad interests, we accept this improved condition of affairs as a sure sign, that all these interests are in an improved condition.

On the whole, therefore, we have nothing but hopeful anticipation for 1886.

I. B. Davis & Son (Feed-water Heaters and Boiler Feed Pumps), Hartford, Conn., write us:

The year 1885 finds us holding our own. The business has equaled that of 1884, and the last few months have been decidedly the best. We are adding from time to time new tools, as they are needed, to continue the work in our various branches. In way of buildings we have added nothing new in 1885.

The Rochester Machine Tool Works, Rochester, N. Y., write us:

Replying to your favor of the 23d, the year 1885, has been, on the whole, a year of dull trade and unsatisfactory *prices*. We have removed our largest planer from our latest designs; added a new shaper, 15″ stroke, to our shop outfit, and have added this tool to the list of the tools built by us for the trade. We have also been engaged the past six months in perfecting a small engine and boiler (one horse and two horse-power) to use kerosene oil as fuel, under the "Braggins patent," and have succeeded in producing an automatic engine, having a strong, rapid steaming boiler, automatic supply of water and automatic fire, that will deliver power at a cost of 3 to 4 cents per horse-power per hour, with no cost for attendance, no smell, dust or ashes, the engine being automatically lubricated on the "Westinghouse" principle. We look forward to quite a trade in these engines in 1886, as well as for an increased demand for our improved planers and shapers. Wages with us are about the same as in '83 and '84, though some of our competitors here have made some reductions in part of their force, if not all. We hail the slight advance in iron and steel as a harbinger of better times to come in the near future.

The Fossil Meal Co. (Boiler Coverings), 48 Cedar street, New York, write us:

In spite of the general depression in trade this year, we have done a comparatively good business.

Our sales in '85 exceed those of '84 largely.

Since beginning of fall a decided improvement in trade generally set in, and has continued up to date, in our line of goods, and the indications are that it will keep up yet for some months to come.

Although the tendency seems to lean toward cheap goods and low prices, first-class articles can stand on their merits and demand a fair price.

The outlook for next year seems to us to be favorable.

Geo. F. Blake Manufacturing Co. (Pumping Machinery), 44 Washington street, Boston, Mass., write us:

During the last five months of the present year our trade has been gradually increasing, and our present accumulation of orders is sufficient to keep our entire force busy on full time for several weeks. During the year we have added several new tools, principally for special work.

We think the prospects for the coming year are good for a healthful, steady trade.

Southwark Foundry and Machine Co., Philadelphia, write us:

We can report an increase of our business during the past year, and have every reason to expect a still further increase during 1886.

The year 1885 showed no material variations in the costs of labor and materials.

In addition to the manufacture of Porter-Allen and Southwark engines, and general foundry and machine work, we have added boilers and tank work, gas holders, purifiers, etc., etc., having refitted our boiler shop with modern tools for the production of such work upon a large scale.

The Curtis Regulator Co. (Pressure Regulators and Steam Traps), 59 Beverly street, Boston, Mass., write us:

As long ago as last June we began to note an increase in orders, which has steadily and rapidly continued to the present time, and has not only exhausted our ordinary stock, but has taxed the whole productive capacity of our works. We have largely increased our working force, added many new tools, and a brass foundry, in which we are turning out over four tons of castings a month.

We have fully doubled our capacity, and still cannot keep up with our orders, which come from nearly every State in the Union, Canada, Nova Scotia, England, and as far as Russia, having filled several orders recently from the latter country.

The Cincinnati Screw and Tap Co., (Machine Tools) Cincinnati, Ohio, write us:

The condition of our business is encouraging. Sales of this year far exceeded those of last. We are continually adding machinery to our already crowded shop. Think prospects for 1886 are good.

The Hewes and Phillips Iron Works (Steam Engines and Machine Tools), Newark, N. J., write us:

Our business during the year '85 (while being an improvement upon that of '84), has not been entirely satisfactory.

Our product has been a large one, but prices have been so exceedingly low that profits have been insignificant. We have been putting in a large number of special tools to improve and expedite our processes of manufacture, and now consider we have a plant excelled by none in the country. We think the outlook for business for the coming year a very favorable one, and from present indications prices of both raw material and the finished product are likely to materially advance.

Wm. P. Duncan & Co., Bellefonte, Pa., write us:

Our business for '85 has been good, not extreme in either direction. Our trade in mining and rolling-mill machinery during the year has kept us fairly busy, the tendency among ore producers and mill men being to introduce such improvements as would tend to reduce cost of product. Our hammer business is very encouraging. We predict a strong revival with advanced prices in the iron market in the spring, and consequently expect to benefit thereby. We base our predictions: first, on a necessarily increased demand; second, on the undoubted scarcity of raw material, ore.

Coffin & Leighton (Machinists' Steel Scales), Syracuse, N. Y., write us:

We have numerous enquiries with a good proportion of orders. Our business is steadily increasing, and the prospect for '86 is encouraging.

James Hunter & Son, North Adams, Mass., write us:

With us the business for the year 1885 has been very quiet; at present inquiries are coming in more freely, though orders come rather slow. We consider the outlook for '86 more hopeful than for the past year. In the line of our friction-clutch pulleys and cut-off couplings, we are having more to do than usual, with new orders nearly every day, and increasing. We make a specialty of these clutches, and have calls for them from all parts of the country. We have them in successful operation from 1 to 400 horse-power.

Howard White (Flexible Metallic Fillets), 44 North Fourth street, Philadelphia, write us:

Our orders have been increasing, and I think the prospects for the new year are very good.

The New Haven Manufacturing Company (Machine Tools), New Haven, Conn., write us:

While business with us has not been as large as we would have been glad to have it, we find that it has been fairly satisfactory on the whole, and, of late, the indications are such as to point to a very much improved trade in the future. We continue fairly busy at our work, with prospect of steady improvement.

Valley Machine Co. (Steam Pumps), Easthampton, Mass,, write us:

Our business for 1885 will not be as much in amount as in previous years, but by keeping expenses down, we have made a satisfactory profit on the capital invested. We have made no reduction in the price of labor, as we fully believe that is the last thing to reduce. Pay good wages, and then let the men earn it, is the plan we work on. We have had much special work to do the past year, but do not expect as much the coming year. We look forward to an increase in our regular work.

Joseph Dixon Crucible Co., Jersey City, N. J.. write us:

Commencing with the first of November, 1884, and continuing until the first of May, 1885, we felt the prevailing depression in the Dixon crucible and Dixon graphite (for lubrication) departments of our business.

Since then the recovery has been marked, and from the first of July to date, our works have been taxed to the extent of their facilities, the selling prices remaining about the same, as they touched bottom in our several articles two or three years ago. Our business in the first half of 1885 was less than the first half of 1884. It increased enough in the latter half of 1885 over 1884 to make the whole year about 10 per cent. ahead.

Almost the same thing can be said about the Dixon American graphite pencil business. We have marketed in this year of 1885 about 40 million of lead pencils, enough to give at least one to every man, woman, and child big enough to use it.

The Osgood Dredge Co., Albany, N. Y., write us:

Our sales for the past year have not been up to the average, but, considering the hard times, we have no desire to complain. The "Jumbo" excavator, described in your paper Jan. 24, 1885, has worked nearly a year now, and has proved a success beyond our anticipation. It has so pleased its owners that they have given us an order for a second. It digs a cut 45 feet wide, and dumps a pile 26 feet high; at the rate of 1,000 yards per day.

We have built for the U. S. Government two large dredges, one for use on the Missouri river at Fort Benton, and one at Keokuk.

We have sold several No. 2 excavators from the designs illustrated in your paper March 7, 1885, and they have given the best of satisfaction. One of them owned by the N. Y. C. & H. R. R., and operated all the season by them, has averaged 900 yards per day, of five hours, which is all the time they could run on account of passing trains. The average time of loading a train of 14 cars, 10 yards to a car, including switching, has been 35 minutes. A moderate number of small dredges completes our list. In our opinion the prospects for next year are slightly better.

Fay & Scott, Dexter, Me., (Machine Tools.)

While business has not been all that we hoped for during the past year, we have kept our full crew working 10 hours per day by adding new specialties to our business. We notice an increase of inquiries for the past few weeks, and hope to see a large volume of business the coming year.

We start the new year with a number of orders on our books, and can only say that if there is any business in our line we shall try hard to get our share of it.

Warner & Swasey (Brass Working Machinery and Machine Tools), Cleveland, Ohio, write us:

We have had sufficient business during 1885 to keep our full force of workmen employed full time.

Our prospects for the coming year are quite favorable, as we now have but a small amount of finished machinery on hand, and have orders that will keep us fully employed for several months.

We contemplate no special changes in our business during the coming year, but expect to gradually increase our plant by the addition of new machinery, as we have in the year just closing.

Adams & Price Machinery Co., 34 to 35 Indiana street, Chicago, Ill., write us:

Considering that we haven't been in the business a year, and (with the exception of the designing and building of some special milling machines for Eastern parties), have confined ourselves exclusively to the manufacture of our specialty, the Adams patent bolt and nut threading Machines, we have every reason to be satisfied with 1885.

We look for a decided improvement in business the first of the year, judging from the better tone to business in general, and to the largely increased inquiries for our machine the past month.

Have introduced our machines among the larger manufactories mostly, and are pleased to know that the many claims we have advanced for them in our catalogue, have been satisfactorily substantiated. We are gradually increasing our plant with the latest and best machinery (our experience teaching us that "the best is always the cheapest") for the purpose of designing and building special machinery.

Beaudry & Cunningham, 70 Kilby street, Boston, Mass., write us:

Our business is the manufacture of forging hammers, dies, forges, etc., in addition to which we build special machinery to order, and handle the productions of other manufacturers. The past six months have shown a great increase in both the number of our inquiries and actual orders. At the present time we have many orders ahead, and the prospects for the next year are most satisfactory. This is owing, in a great measure, to the introduction by us and the popularity of our Beaudry upright power hammer which we are sending to all parts of this country, and exporting largely. To-day we received our third order from a well-known cutlery company, and we are building several large hammers for axle-makers and others. We have made some important improvements in this machine this year, and now our only fear is that those we have sold will never wear out. In regard to increased facilities, would say that we have plans under consideration, which, if adopted, will give us an entirely new plant. We find labor is a trifle dearer, and the price of iron, steel, etc., moving up.

Geo. B. Grant (Gear Cutting), 66 Beverly street, Boston, Mass., writes us:

My business has been good, sometimes pressing, for 1885, and I can see no prospect of hard times for 1886.

I have made no change in my business except to improve my facilities for cutting large gears, and for doing work of a fine and accurate character.

In both these respects I find that my efforts are appreciated by the machine trade of Boston and vicinity, which has heretofore been obliged to send away out of the State for gear work made out of the ordinary run.

Stearns Manufacturing Co. (Saw Mill Machinery, Engines and Boilers), Erie, Pa., write us:

The volume of business for our specialties has much increased within the past two months. As our transactions are directly attributable to the demands of trade and arise in no way from speculative demands, we feel justified in anticipating a good business for 1886, especially as we begin it with a full order book. We have made no changes in our equipment the past year nor do we contemplate any at present.

The Buckeye Engine Co., Salem, Ohio, write us:

Our business of 1885 has been more favorable than we had reason to expect at the beginning of the year, and in volume has been quite satisfactory. The number of engines sold during the year is 125 as against 115 for 1884.

We have been during the year, except the summer months, with about 200 men running full time, and for the past three months have been a portion of the time running thirteen hours a day.

During this year our prices have been shaded fully equal to the reduced prices of material and labor.

The present indications now are, for the business in 1886, more flattering than for some time past.

As prices are stiffening on material at present, with other additional indications, we shall be disappointed if 1886 does not far exceed the business of 1885.

Our sales have been distributed pretty generally throughout all the States and Territories, with some shipments made to foreign countries during the year.

We have recently put in market an engine especially for electric light purposes, which we have had a good run on during the year, and on the whole have had our full share of orders on all our different specialties, and are now running on full time in order to fill the demands for same.

S. W. Goodyear (Wire Pointing Machinery), Waterbury, Conn., writes us:

In my line business has been more *promising*, than otherwise, for the past year, inquiries have been plenty, and very suggestive of much business, but orders have been few. Inquiries seem to me to be made more for the purpose of getting information for future use, depending upon the contingent action of somebody or something, than upon any intention to buy at once. Still, I have taken a number of good orders lately, and things look better, so that I feel very hopeful.

Pancoast & Maule (Pipe-cutting Machines, Steam Heating Apparatus, Wrought-iron Pipe, etc.), 243 South Third street, Philadelphia, write us:

While the outlook for the coming year is certainly better than it was in December, 1884, our views, to be truthfully painted, would not consume much roseate pigment.

Currier & Snyder (Upright Drills), Worcester, Mass., write us:

We have done about 20 per cent. more work this year than we did in 1884; have added new machinery and new patterns. If prices had been satisfactory, we should have been very well satisfied with our year's work. We are prepared to do more work next year, and hope business in general will improve soon, and thus regulate prices. We are now making a new 20″ back-geared drill, which we think will suit the trade.

Sterling Elliott, Newton, Mass., writes us:

The year just closing has been the most satisfactory one of my experience. My regular business (drills, cutting-off tools, etc.) has been very dull, but the stitching and tying machine (which you illustrated in your issue of Nov. 21st) has kept us very busy, with a prospect that present facilities will be too small to take care of orders for next year. Have put in several new tools and a larger engine the past season, and expect still further increase in spring.

Wm. T. Comstock (Drawing Instruments), 6 Astor place, New York, writes us:

Business seems to be somewhat improving with us, but no very great advance, nor do we expect it. We have faith enough, however, in the future to extend our lines somewhat. We look for a steady growth in business during the next year, but no very great advance in prices, nor anything like what might be called a boom.

Rollstone Machine Company, 45 Water street, Fitchburg, Mass. (Wood-working Machinery, Angle Unions, etc.), write us:

Business for the year 1885 has been quite unsatisfactory, although we, no doubt, have received our share. We have added some new tools, and are building quite a number of specialties, which will, no doubt, command a large trade the coming year. Prices have ruled very low, and forced a reduction of wages. We are now very busy, although working on a very small margin, still hoping for an early increase of prices and reinstatement of wages, believing it for the best for all parties concerned to pay a fair remuneration for labor. We have been much encouraged the past month, and prospects are good for 1886.

Forbes & Curtis (Die Stocks, Pipe-Cutting and Threading Machines, etc.), Bridgeport, Conn., write us:

We have been behind our orders for some four or five months, and will begin the new year with a fair list of unfilled ones. We can say the outlook is such that, where we have heretofore made twenty-five articles at a time, we are now making up four times that number. We are working about one-third more men than at this time last year, and have added several standard tools to our plant, and will undoubtedly have to add others before long. Our wages are the same as last year, and are paying about the same for materials. Our output has been all we could hope for during the year. We have every faith in a larger demand and better prices for 1886.

H. L. Shepard (Foot and Power Lathes), 341 West Front street, Cincinnati, Ohio, writes us:

Business is very good with me at present. Since making some new improvements in my lathes, I have been compelled to add new machinery, and expect to add a number of hands to my working force after January 1st. Business has continually increased every month this year, and the outlook for the coming year is very flattering. My foreign trade has taken a very decided increase, especially in Italy and other European countries, where heretofore it has been hard work to sell.

Wm. A. Sweetser, Brockton, Mass., writes us:

I bought out the Brockton Machine Company, of this city, September 1st, 1885, and since October 1st I have had all the work I could do (mostly in tack machinery) with the present room and machinery that I have. Business is very good now, with a very good outlook for 1886. Prices are *very low*, but wages have not changed. Material is a little cheaper than last year.

Betts Machine Co. (Machine Tools, Standard Gauges, etc.), Wilmington, Del., write us:

Business during the year just about to close has been very dull, and prices lower than they should have been. During the last two months there has been a decidedly better feeling and increase in business, and we look for a better trade in the year 1886, with prices better maintained.

If our opinion is worth anything, to all who will, in the near future, need machine tools, we would say, *buy now.*

We have not erected any new buildings this year, but have been getting our tools in better condition for the revival of trade.

Cleveland Twist Drill Company, Cleveland, Ohio, write us:

We were very much disappointed in the volume of trade for the first half of 1885, but since July 1st our trade has steadily increased. We now have all we can possibly do in our reamer and special tool department, and orders ahead on our books for drills. We are not running full time in our drill department, however; but, should business continue as good for sixty days more, will put on more hands. Prices are lower than at this time last year—in fact, at cost; and there is very little encouragement in this respect at present.

James E. Hotchkiss, 86 John street, New York, writes us:

The past year, like the preceding eight years, has shown a steady increase in the sale of my mechanical boiler-cleaner in the United States, as well as in foreign countries—notably among large users of steam, who are enabled to obviate the necessity of frequent cleaning of boilers by its use. Large orders have been placed with such concerns as Geo. V. Hecker & Co., Havemeyer & Elder, Brooklyn Waterworks and others, using from six to sixty boilers.

Acme Machinery Co. (Bolt, Nut and Special Machinery), Cleveland, Ohio, write us:

Our business during last year has been very satisfactory, and, as the merits of our improved "Acme" bolt-cutters are getting better known, orders are increasing correspondingly. For the last three or four months orders have come in so rapidly that we were obliged to run overtime occasionally, but have lately added quite a number of tools and special appliances, as well as quite an increase to our force, that enables us by ten hours' work a day to fill orders more promptly. Prices for our products have been very low, while we have lately advanced prices for skilled labor. Orders now on hand will keep us busy for some time, and, as inquiries are quite numerous lately, we are hopeful that 1886 will be a prosperous year.

Schleicher, Schumm & Co. (Otto Gas Engines), Philadelphia, write us:

Our business nearly held its own compared with last year; we expect a good increase in the coming one.

Randolph Brandt, 38 Cortlandt street, New York, writes us:

The year 1885 has proved a far better year than I anticipated in my business, which is largely affected directly by the sale, and subsequent use, of engines and pumps. During the month of October my sales of the Selden packing were greater than any one month since it has been on the market. I can see no good reason why 1886 will not bring a healthy volume of business with fair profits.

The L. B. Flanders Machine Works (Pedrick & Ayer, proprietors), 1025 Hamilton street, Philadelphia, write us:

Our business year closed Sept. 30th last, and considering the general depression that prevailed, we are quite well pleased with the showing. We are continually adding to our list of special portable tools for railway-repair shops, and have put in several new tools for facilitating our work. We have added considerably to our floor space within the past month, and have made alterations and improvements in every department. Our new and enlarged tool-room is almost finished, and we will soon be in shape to turn out work to much better advantage than ever before. Our orders for special tools are coming in very frequently, and should they continue during 1886 as they have for two months past, we will have a repetition of 1882. We build our tools of the very best material, and the workmanship is necessarily fine. We have the highest kind of endorsements from almost every prominent master mechanic, and our inquiries are very numerous.

We have some of the twenty-eight different sizes of our portable cylinder-boring machines for re-boring cylinders in *present positions*, in almost daily use, and our piston packing is being put in almost every cylinder we rebore, when new pistons are required. We have made Corliss-engine repairs a specialty, for years past, and are very busy in repairing this and other makes of steam-engines. The outlook for 1886 is very encouraging.

Beecher & Peck, New Haven, Conn., write us:

Our business for the past year, until within the past two months, has been very light, in comparison with the preceding two or three years. We are now, however, quite busy, having received a goodly number of orders, both for our drop presses and for drop forgings, and the outlook is indeed encouraging. Among our orders for drop forgings is one for a large number of a patent pipe and nut wrench, having made a contract that will cover a year. We expect a booming spring trade.

Ferracute Machine Co. (Presses, Dies and Sheet-metal Tools), Bridgeton, N. J., write us:

Whilst we kept rather busy during the first three quarters of the year—partly in consequence of large unfinished orders given in 1884—business has been falling off somewhat during the last three months. The regular demand (as in other goods) has been considerably below its normal volume, competition unusually keen, and prices rather low. There are no indications of immediate improvement; yet we think that we can look for increased sales next year, more particularly in connection with our new punching presses, in which we have embodied a large number of valuable improvements, such as are liable to create a demand for them. We are considerably increasing our facilities, having just now put in a 60 horse-power boiler, and will soon add a boring mill and some other tools.

The Hendey Machine Co. (Machine Tools), Torrington, Conn., write us:

Our business for 1885 has shown a decided improvement over the previous year, our sales being at least fifty per cent. more than in 1884. The improvement for the last two months has been *very* marked, and far exceeds our anticipations.

We have kept our force at work, through the spring and summer, only five days per week, but since September have run full time, and increased our force a little. Have not added anything to our machinery worth mention. On Jan. 1, 1885, we reduced our prices. We have made many improvements in our tools, and also added three new sizes to our list of shapers, having now six sizes.

We think our improved business due partly to these improvements and low prices, as well as to improvement in business generally, people appreciating the fact that prices are as low as good machinery can be furnished for. Prospects for 1886 we consider very good.

Brown & Sharpe Manufacturing Co. (Machine Tools, Fine Castings, etc.), Providence, R. I., write:

Our business this year has been fairly prosperous. From January 1st to February 16th, we worked eight hours per day, but since the latter date, ten hours, with an average of 450 hands. We have added nearly thirty machine tools to our plant, and built a store-house for lumber and other materials, 275 feet in length. For a month or two past, there seems to have been a better demand in all our lines of tools, and we look for an increased business during 1886, particularly in "Universal milling machines," the prices of which have recently been largely reduced.

Ball Engine Company, Erie, Pa., write:

Our business for 1885 has been fifty per cent. greater than for 1884, and on the whole quite satisfactory.

We look forward to a still better business for 1886, and think the indications for business generally are good.

During the past year, our facilities for manufacture have been somewhat increased, and we have made many improvements in our work.

D. Saunders' Sons (Steam and Gas Fitters' Tools), Yokners, N. Y., write us:

Our business for the past year compares favorably with 1884. In reference to the prospects in our line of tools for 1886, in our opinion there will be more of a demand, but we do not think prices will advance.

Poole & Hunt (Turbine Wheels, Engines, Shafting, Gearing etc.), Baltimore, Md., write us:

During the year 1885 our establishment has been well employed, though not so busy as during 1884. We have no change in rates for labor to report. Materials of some kinds have slightly advanced. The prices obtained for finished productions are too low. We have added largely to our facilities during the year, and are prepared to produce machinery in our line, of a better quality than ever before. We have no special opinions as to the prospects for 1886, but have faith enough in the future to induce us to commence an extension to our machine shop, 60′ × 90′; a new erecting shop, 80′ × 150′; a new smithery, 60′ × 150′; and a new boiler shop, 80′ × 150′.

The Watts, Campbell Co. (Corliss Engines and Pumping Machinery), Newark, N. J., write us:

The past year has been one of sharp competition and low prices. We have been busy, having run our establishment full time and with our usual number of employes, and have turned out more work than the year previous. We think the prospects brighter for 1886, and that inquiries are more numerous. We have a fair number of orders on our books, which will keep us busy for the next three months.

Lodge, Davis & Co., Cincinnati, Ohio, write us:

Notwithstanding the hard times, we have steadily increased our business. Have added a number of new tools—one automatic gear cutter, one large horizontal boring lathe, two large radial drills, three engine lathes, and two shapers, two chucking lathes, and other new and improved tools.

Have sold 51 of our new improved 24″ shapers, and have a number of orders booked for more. In our line of manufactures we have added two new turret lathes of large size, made specially for the manufacture of iron valves, and embracing the features of power and length feeds for turret, in addition to screw-cutting device.

Have also added the most improved 60″ turret chucking lathes, and a fine rotary planer, with 36′ cutter head.

Are paying, as yet, same price for labor as last year, but note a tendency to advance on account of our work demanding a higher class of workmen.

We have orders enough booked ahead to keep us busy for the next three months.

Find quite an appreciable advance in raw material.

G. S. Woolman, 116 Fulton street, New York, writes us:

During the earlier part of the year, the demand for my drawing materials, transits, levels, etc., was not encouraging. Trade was secured only by hard work and constant solicitation.

The last five months of the year have, however, shown a decided increase. The demand is steadily increasing without there being any great rush. The demand is shown particularly in the increased inquiries as to costs of outfits for civil engineers for railroad building. Designers and draftsmen in all fields of work are also using more materials than heretofore. I have noticed specially that the inquiries for goods are for better grades than heretofore, prices not seeming to be of as much importance as quality. Some of the articles I make specialties of have had a decided increase of sale. Prices remain the same as heretofore. Orders are still filled promptly; although in a few minor articles the supply has not been quite equal to the requirements.

Altogether whilst the year has not been a remarkably profitable one, it will show a fair profit. I look forward to the year to come, with much hope of success, and think the prospects are good for an active business.

Williams, White & Co., Moline, Ill., write us:

Our business is largely with manufacturers, and it seems to us that there is a decidedly better feeling. We are having an increased demand for drop presses, bending machines, hammers, and the goods that we produce generally. We have made no change in plant or wages the past year. The feeling is general that we are now on the up grade.

Remington & Co. (Adjustable Flue-hole Cutters, Steam-engines and Mill Furnishing), Wilmington, Del., write us:

Our business during the past year has been as good as we could expect, having had but a very short dull period, which was in the months of October and November. The amount of business done will equal that of the preceding year.

The outlook for the coming year is to us indeed very encouraging. We are now running full on our regular work, and are building a two-story brick extension to our machine shop, 60x40 feet, in which we will put new tools for the manufacture of steam pumps. Judging from the number of inquiries we have recently received for Corliss engines, we expect a good trade in this branch of our business. We anticipate being able to average 125 to 150 hands the year through.

John H. McGraw, 187 West 8th street, Oswego, N. Y., writes us:

The demand for my adjustable tube roller expander, as it is becoming known, is increasing fast, inquiries coming in by every mail, to such an extent that, with improved facilities, I have, within the past thirty days, reduced my price-list from fifteen to twenty-five per cent., in order to give my patrons the benefit.

The Billings & Spencer Co. (Drop Forgings and Special Tools), Hartford, Conn., write us:

Our business for the year 1885 has been rather quiet, especially in orders for special goods. Our line of finished machinist tools have sold very finely throughout the year, in fact we have done more in this line than in any previous year. Orders for iron and sheet drop forgings are now coming in freely, and we look for an increase of business with the coming year.

[*A number of letters stand over to appear in our next issue.*]

The Pillings Automatic Engine.

The engine from which the accompanying engraving was made is a 6″x12″ center-crank, or self-contained engine. They are built, however, either like this, or with girder-frame or outboard pillow-block.

The cylinder is of the four-ported type, the valves being independent of each other, that is, they have separate valve-rods connected by link to quadrant, which is cast with main link. The main link has sliding-block connected to eccentric-rod and to governor-rod. The governor slides this block up or down, which controls the admission.

The frame, as here shown, appears to be strong and well braced. The crank-shaft is in diameter half the bore of the cylinder, and the crank-pin is of equal diameter. The main journal-boxes are four-ported; all small connections have hardened steel bushings, and pins are of hardened steel. The valve movement is short, and one valve is practically at rest while the other is in motion.

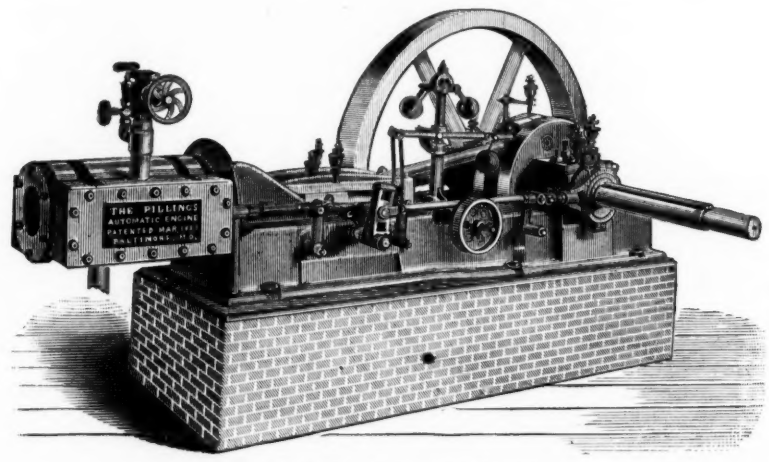
The engine is designed to run at high speed if required. We are informed that the one shown has been run at 600 revolutions.

The manufacturer is G. T. Pillings, Baltimore, Md.

Extended Fronts—Smoke Stacks.

The following remarks of Angus Sinclair, at the December meeting of the Western Railway Club, are worthy of consideration.

"I have been around the country a good deal, and come in close contact with those who are using the extended front, and I find that while there are a few who have it in use who are not perfectly satisfied with it, a great majority are highly satisfied with the results obtained from it. While I never had anything to do with an extension front myself, when I was running or when I had charge of engines, I had a great deal of experience with locomotives with open stacks. Abroad, where I had my first locomotive service, we had nothing but open stacks and when I came to this country the first thing that struck me about the locomotives was the intense draft that was used to make the engines steam. I hadn't been long doing locomotive work when I came to the conclusion that the necessity for this intense draft, peculiar to American locomotives, was the practice of obstructing the stack to prevent the throwing of sparks. Now, the philosophy of the thing is, that you found it necessary to put in spark arresters for wood, and when you came to burn coal you still retained what was really a vicious practice; and I am satisfied, from a very wide experience, that an English locomotive, with no diamond stack, no netting, nothing to prevent the throwing of sparks, throws much less sparks than any ordinary American locomotive, well equipped with the best spark arrester. The reason is that you try to restrain the sparks, and then you have to increase the velocity of the gases which force them out. By trying to prevent them you make more of them. On account of that, I thought working towards extension fronts and open stacks was working in the right direction. If by having no obstruction in the stack you are going to be able to open your nozzles so that you will have a very mild draft, you will not have the same necessity for catching the sparks or preventing their going out, because there will not be so many of them. A very slight increase or decrease in the nozzles has a most remarkable effect on the quantity of sparks that are drawn through to the smoke-box. So far as spark arresters are concerned, I have seen two forms of engines in this country that I thought were perfect spark arresters. One of them is called the Grosbeck spark arrester; there are several of them on the Eastern division of the Erie. It is illustrated in the master mechanic's report of two years ago. It carries a water tank in the smoke-box, and the sparks as they come through the flues are injected into that water tank by a diaphragm. I have ridden on one of these engines at night, while the engine was working pretty hard, and I could not see any sparks coming out. Another good spark arrester that I have seen is the Buchanan engine. That is an engine with water table across the fire-box, and extension front, with very wide nozzles. I rode on one of these engines one night, with a fast train making up time, hammering along at a mile a minute, and when they were going through tunnels I could very rarely see a spark. Those I consider the best spark-arrester engines I have ever seen anywhere even in England. In regard to material for smoke-stacks, I have seen cast-iron stacks used very successfully in two instances. I am surprised that master mechanics have not gone more into this matter, as stacks are a very considerable source of expense, both for material and labor. The elevated railroads of New York use cast-iron stacks entirely and very successfully. Cast-iron stacks are also used on the Richmond and Danville Road, giving good satisfaction. I have been surprised that none of you have said anything about the proportions of stacks. I think it is a very important matter in relation to the steaming of the engine, and I do not believe it has received as much attention as it deserves. It may be that the diamond stack is not so much influenced by its diameter as an open stack, but I am certain that if the same diameter of stacks as are used for diamond were used for open stacks they would be in nearly every instance too wide. You can effect a much better vacuum in the smoke-box, with a lower velocity of exhaust steam, when you have a narrow smoke-stack than you can with a wide one. Of course there is a point where the narrow stack would be too narrow to permit the gases to pass through well; but our ordinary practice, I am persuaded, is to have them much too wide for creating an easy vacuum in the smoke-box.



THE PILLINGS AUTOMATIC ENGINE.

Recently, William Wallwork, of Great Lever, Bolton, an engine-driver in the employ of the Lancashire and Yorkshire Railway Company, was presented with £35 in recognition of the courage displayed by him on the 29th of December last, in remaining on his engine in face of great danger, and avoiding a most disastrous collision between an express and a goods train at Hindley, on the Bolton and Liverpool line. The circumstances of the case were as follows: The 2.15 express train from Liverpool to Bolton missed the points at Crow Tree Junction, and dashed into a siding where a goods train was standing. A terrible collision seemed inevitable, as the express was going at a great rate of speed. The fireman, perceiving the danger, leaped from the engine, but Wallwork, with great courage, seized the brake, and by dint of great efforts, in the face of almost certain death, so minimized the collision that no lives were lost, though many were severely injured, himself among the number. A number of Bolton gentlemen, including three burgh magistrates, passengers in the train, were so struck with the gallantry displayed by Wallwork that they opened a subscription list, with the above result. Capt. Brewer, her Majesty's Inspector of Factories for the district, and who was a passenger in the train, made the presentation.—*The Railway Review.*

How to tell the speed of a train: Count the revolutions for a number of seconds equal to $\frac{2}{11}$ of the diameter of the drivers in inches. The number of revolutions counted will be the speed in miles per hour.—*Engineering.*

Experiments on the Transmission of Power by Gearing.

EXTRACTS FROM A PAPER READ BEFORE THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

BY WILFRED LEWIS.

The idea of determining by experiment the relative values of different forms of gearing, as measured by the economy with which they transmitted power, originated with J. Sellers Bancroft, in the spring of 1883, and soon afterwards investigations were begun at his instance, and carried out under his direction, by Wm. Sellers & Co., Philadelphia, Pa.

The principal requirements in the problem presented, were a dynamometer to measure the power received by the worm or pinion-shaft and a brake to measure the power delivered to the wheel shaft.

The chief difficulty in the perfection of the scheme lay in the construction of a dynamometer which should not have the errors and defects common to such machines.

The brake used to measure the power transmitted was designed to maintain an approximately constant load of any desired amount. It consisted of a drum or pulley encircled by a Napier brake of rather novel construction, in which the load itself was made to adjust automatically the tension on the strap.

By this means there were no extraneous forces involved, and no corrections to be made, and the error usually arising from the use of an auxiliary tightening lever was avoided.

As a precaution against excessive heating during the progress of experiments, this brake drum was provided with deep internal flanges forming a trough through which water could be made to pass by means of a siphon.

The worm-box was made very large, to insure an abundance of oil, and dissipate, as fast as possible, the heat of friction. It also acted as a reservoir for the lubrication of the journal and step-bearings, and as a bath in which a thermometer could be kept to note the temperature from time to time.

Power was received by a belt to the driving pulley from an independent engine, the speed of which was under the control of the experimenter.

At moderate speeds everything ran smoothly, but as the speed was increased, the step-bearing of the worm-shaft began to give trouble. This bearing was formed by the contact of two hardened steel disks carefully ground, and although well lubricated by a circulation of oil, the danger of cutting at high speed was constantly apprehended.

The experiment was finally made of introducing a loose washer of hard brass between the hardened steel faces, and no further evidence of cutting at this point was detected for any combination of speed and pressure.

The brake strap was also at first another source of annoyance. It was made of a flat iron strap lined with hard-wood blocks on end-grain, and for a time it worked well, although not quite as steadily and smoothly as could be desired.

There appeared to be considerable variation in the friction of these blocks against the drum, and the weight suspended was, in consequence, thrown into oscillations, which had to be checked before the distance could be properly measured.

For the purpose of improving its action, the brake-strap was lubricated with a mixture of tallow and oil, which at once produced the most alarming results. The load was thrown into the most violent agitation, and the apparatus shaken in a manner which threatened to break it down. Having failed to secure a satisfactory brake surface of wood, it was decided to try leather, on account of its peculiar frictional properties, which made it an exception to the general rule that friction of motion is less than friction of rest.

Accordingly, each block of wood was covered with a leather face, and all further difficulties of this kind were effectually checked.

It was not suspected, until the experiments were about to be concluded, that the dynamometer itself was liable to any error at all, and it was then discovered, when too late, that it had a constant error of about two per cent., which was either positive or negatives according to the alignment of the universal joints.

The first series of tests was made upon a double-threaded worm 4 in. diameter, gearing with a worm-wheel of 39 teeth, $1\frac{1}{2}$ in. pitch, the thrust of the worm being taken on its annular surface instead of upon the step-bearing used in other series. The remaining series upon this form of gearing, were made upon worms having cast or cut teeth of single and double threads, all of the same pitch and diameter, gearing with the same diameter of wheel. Four series were made with spiral pinions 4 in. diameter, $1\frac{1}{2}$ in. pitch, having respectively 1, 2, 4 and 6 teeth, gearing with a spur-wheel of 30 teeth, and one series with a spur-pinion of 12 teeth, $1\frac{1}{2}$ in. pitch, gearing with the same wheel.

In every case the material used was cast iron, and to facilitate comparisons, the wheels and pinions were all made as near as possible to the same dimensions.

At very high speeds, the rubbing surfaces were more liable to cut, and beyond certain points which could not be definitely determined, the efficiency appeared to diminish.

In different cases, variations of temperature and pressure were accompanied by such contradictory results that no generalizations could be made concerning them.

As already stated, the condition of the rubbing surfaces could be judged of only by it, effect. At certain speeds and pressures the efficiency would slowly increase to its maximum, while at others it would suddenly diminish and indicate the destructive action known as cutting.

Upon examination, this destructive condition did not always become apparent to the eye, and, in some cases, the apparatus was taken apart and cleaned, without making any decided improvement in efficiency, but it was finally discovered that in such cases it was necessary to restore the surfaces to their best condition by running for some time at a moderate speed and pressure. From this it appeared that the order in which the experiments were made, had an important bearing upon the results obtained, and it also furnished a satisfactory explanation for the contradictory appearance of many experiments which were otherwise made under apparently the same conditions.

The first series of experiments was made upon a double-thread worm 4 in. diameter, gearing into a worm wheel of 39 teeth $1\frac{1}{2}$-inch pitch.

There are 114 experiments which cover a range of speed from 3 to 790 revolutions per minute, and loads up to 4,000 lbs. upon brake wheel.

The worm and wheel had cast teeth, and the thrust of the worm was taken upon the worm itself instead of upon the shaft step, as in the subsequent series.

This series was unexpectedly brought to a close by the breaking of the worm teeth, which were found to have been entirely ground away. The wheel, however, was in good condition, the wear having been just sufficient to polish the surface of the teeth.

The second series of experiments was made upon a single-thread cast worm and wheel,

the thrust being taken on the step at end of worm shaft.

So long as the condition of the rubbing surfaces is unimpaired, the efficiency appears to increase with the speed, and even after cutting has begun, the same general tendency will be observed, although starting from a lower degree.

The principal object in this series was to determine the limiting speeds and pressures at which the worm could be run without danger of cutting. These speeds were also found to depend upon the temperature and duration of the experiment, and they were, consequently, not clearly defined; but in general it was noticed that at slow speeds, the greatest efficiency was found under the heaviest pressures; atmoderate speeds under moderate pressures, and at high speeds under light pressures. This seemed to point toward a limiting product of speed and pressure, beyond which the heat of friction became generated so rapidly as to impair the condition of the surfaces in contact and produce cutting.

The following table shows the conditions under which cutting was found to take place within periods of ten minutes. In all cases the precise time at which cutting occurred was marked by a sudden rise in the reading of the dynamometer, and from the reading at that time the final efficiences were computed. In the last experiment no cutting took place, as shown by the constant efficiency of .677:

SPEEDS AND PRESSURES LIABLE TO PRODUCE CUTTING.

Velocity of Sliding in Feet per Min.	Pressure on Teeth.	Temperature.		Efficiency.		Duration of Run in Minutes.	Ft. lbs. per Min. Consumed in Friction Before Cutting Began.
		Initial.	Final.	Initial.	Final.		
800	1785	106°	140°	.609	.387	6	117,600
880	1780	118°	132°	.607	.462	3	129,300
880	1205	137°	150°	.575	.360	3	97,000
800	448	118°	133°	.594	.445	10	29,400
480	2822	144°	167°	.591	.450	7	117,800
400	3481	170°	180°	.639	.415	3	98,300
360	4837	138°	166°	.641	.473	6	122,400
306	5558	163°	186°	.677	.677	10	102,000

It appears from this table that the danger of cutting does not depend entirely upon the amount of frictional work, and it is not easy to understand why this should be the case, but the fact remains, and we are forced to conclude that very high speed should be avoided, even under light pressures, and that the best working conditions are to be looked for at or below 300 revolutions per minute, which corresponds to a surface velocity of sliding of about 300 feet per minute. A great deal, of course, depends upon the rapidity with which the heat of friction can be conducted away.

For the apparatus used it was determined that when one horse-power was consumed in friction, the worm-box remained at a uniform temperature of about 50 deg. above the surrounding air, and, assuming the rate of cooling to be proportional to the difference in temperature, it seems improbable that more than two horse-power could be continuously consumed in friction without overheating the lubricant.

The third series was made on gearing similar to that used in the first series, with the exception that the thrust of the worm was taken upon the step at end of worm shaft instead of upon the annular end of the worm itself. At the conclusion of this series the step-bearing was found to be in good condition, the rubbing surfaces having worn to an annular bearing of, say, from one to three inches diameter.

The worm-shaft and its bearing at large end, however, were badly cut. In this series the limiting pressure for a speed of 300 revolutions appeared to be about 4,500 pounds for a run of five minutes. A pressure of 5,600 pounds at a speed of 280 revolutions per minute and temperature of 190 deg. produced cutting in three minutes, but whether on the teeth or in the journals it was never possible to determine without taking the apparatus apart at the sacrifice of considerable time. But this cutting would naturally be supposed to take place sooner on the teeth where the intensity of pressure was greater.

One more series completes the experiments upon worm gearing. This was made upon a worm and wheel similar in every respect to those used in the second series, except that the teeth were cut instead of being cast. The speeds, however, were kept below the limits found by previous experiments to produce cutting, and the temperatures were consequently moderate, ranging from 48 deg. to 116 deg. in extreme cases. In this way the rubbing surfaces were kept in good condition throughout, and the results are altogether more satisfactory than any yet recorded.

It had been previously observed that under moderate speeds and loads the efficiency of the apparatus would continue to improve until a maximum limit appeared to be reached, and, in order to obtain observations under the best working conditions, a rule had become established not to begin noting down experiments until after the apparatus had been warmed up once or twice in running.

From the experiments made to determine the limiting speed and pressure at which worm gearing can be run successfully, we conclude that when the gearing is loaded to its working strength, it is not safe to exceed a velocity of sliding of 300 feet per minute, and that in general, the best working conditions are obtained at or about a velocity of 200 feet per minute.

The amount of sliding per revolution of pinion-shaft is about 7.5 in. on pinion shaft, 3 in. on teeth, and 3 in. on drum-shaft, and the product of these numbers times the pressure in each case gives the relation of 7.5, 3, and 4.5, the sum of which is 15. Of this total effect the friction of the gear teeth consumes .2.

Therefore, it appears on this assumption, that the principal loss in effect with spur gearing is from journal friction.

The experiments which were made to determine the friction of the worm-shaft under various loads and speeds showed, for a pressure of 800 pounds, coefficients ranging from .15 at the start to .006 at speeds between 110 and 240 revolutions per minute, and for a pressure of 3,440 pounds, coefficients ranging from .12 at the start to .033 at a speed of 240 revolutions per minute.

Theoretically, for worms of 20 deg. pitch, the difference in efficiency for the teeth alone should not exceed .03, but the side thrust on worm-wheel would probably increase the friction considerably if larger angles were used.

Additional experiments were made to determine the efficiency of spur-gearing, in which the reduction corresponded more nearly with that of the single and double-thread worms. For this purpose the driving-gear of an old 48-inch lathe, which had been for many years in use, and, consequently, represented the best attainable conditions, was called into requisition. This lathe was provided with double-back gears which gave, respectively, reductions of 38.4 and 10.2 to 1. The countershaft was driven by the dynamometer, and the power transmitted was measured by the brake, already described, carried between the centers. The efficiency of the lathe was measured for every speed under different loads, the average results of the test showing that for a reduction of 10.2 to 1 the efficiency was .952, and for a reduction of 38.4 to 1 the efficiency was .935. The power required to run the lathe empty was, of course, excluded in the calculations, otherwise the efficiencies would have had a different value for every load, becoming almost *nil* for light loads and approaching the figures given for heavy ones, such as the lathe was expected to carry.

These experiments showed conclusively the advantage of spur gearing over all other kinds in point of efficiency and durability, for not only is there less friction, and, consequently, less wear, but the wear in spur-gearing is distributed over a great deal more surface.

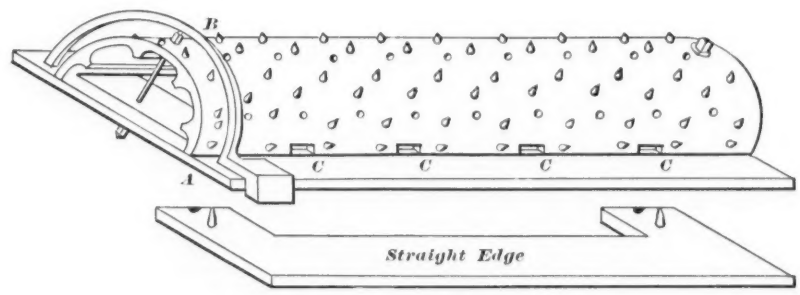
LETTERS FROM PRACTICAL MEN.

Cylinder Packing—Oil in Exhaust.

Editor American Machinist:

I like the closing remarks of J. A. Hill, Dec. 26, on "Packing Rings," that he "would rather think incorrectly than not at all." He is on the right track. If our young mechanics would drive a peg here, and follow the trail, instead of standing around street corners or going where their minds are distracted from their business; if they would go to the free libraries, or mechanical lectures, or study mechanical problems, we would not hear so much of the inferiority of American over English mechanics. Let any young R. R. machinist take the articles published in your valuable paper on "Modern Locomotive Construction," get a scrap-book and make sketches of each engraving, and try to fix in his mind the valuable lessons there given, and I warrant you in less than ten years some prominent railroad will give him a *call*, and put M. M. or S. of M. P. behind his name when addressing him by letter. If a young man wants to make his mark he must study; work out the problems of science or mechanics, if he would prosper. As an eminent lawyer said: "There is always room at the top." I told a young man several years ago, when starting out as a telegraph operator, to set his mark at the top and aim at it; "go for it," as the boys say. I am proud to say he is going up. "Strike high, if you lose your hatchet," is worth remembering.

SKETCH OF BULL RING.



CORE ARBOR FOR PIPE.

But I am wandering. I was going to say something about packing rings. During the last twenty years I have tried almost every kind worth trying, and I find the simplest the best. I have no use for sectional packing rings for locomotive work. They are always loose, and the wear is very rapid when it commences. The narrow ring has not bearing enough, and soon wears out, leaving it thin at the top, as the bull ring protects it at the bottom. If Mr. Hill will make the bull ring like sketch, and put a ring 1″ wide at each side, letting the piston-head and follower make the joint on the outsides, and high part of bull ring for inside, turning the rings $\frac{1}{4}$″ larger than cylinder, $\frac{5}{8}$″ or $\frac{3}{4}$″ thick for 16″ diameter or over, letting the inside of bull ring be $\frac{1}{8}$″ or $\frac{1}{4}$″ larger than lugs, so that the piston can be lined up to the center, he will have something good. I always cut at an angle, and pin the bull ring to keep rings from turning. This kind of packing is cheap, always tight, and has large bearing surface on cylinder. Having the ends of rings milled as Mr. Hill suggests is a bad thing; the greatest strain is on the open ends, and this being the weakest point they will break off. I have had the broken ends to work under the ring and make bad work.

Mr. Woolson must make some arrangement for catching the grease thrown out with his exhaust water, or he will soon have his pump valves and flues and sides of cistern also, clogged with it to his sorrow. Yours,

J. J. BINGLEY.

Core Arbor for Pipe.

Editor American Machinist:

Having to rig up to make pipe of 10′ and less lengths recently, and being limited for shop room, the demand for the pipe urgent, and having to cast them horizontally in green sand, some way had to be devised to insure results—more so than green sand on arbors usually gives. These pipes have to be bored, and unsoundness would condemn them.

The accompanying sketch will give an idea of the form of arbor, designed and used for the above purpose. The arbor was cast in longitudinal halves, with prickers and good large vent-holes $\frac{3}{4}$″ in diameter. The arbors are planed on the edges to fit straight and parallel pieces that moulders call straight-edges. These pieces were made of cast iron, planed straight, and dowell-pins put in ends to fit corresponding holes in bar, cast in end of arbor, the two straight-edges coming together at ends of arbor, so that a bolt put through from outside to outside, with large flat washer, holds the straight-edges to arbor firmly. *A* is the straight-edge; *B* is the sweep, of any size that the straight-edge will guide. The core sand is prepared as usual and the thickness required, rammed firmly on and then swept to size by the sweep *B;* then each half is dried with straight-edges on. After drying, the halves will go together and fit as true as the leaves in a book. It is the neatest mode of making cores of this character, as but one man is required, except to put them in the oven and join them together. When securely bolted together, they are as rigid as a solid arbor.

In using a great number of times, there is more liability to crook than with whole arbors. To counteract this tendency, ribs were cast inside as large as could be made to hold the arbor straight. Should I make more of these arbors, I think that openings in joint, as shown at *C*, could be cast in and drilled and tapped for tap-bolts, which could be screwed down until the edges are in line; this would save planing the joint, and, should the arbor crook in use, the bolts could be adjusted to the straight-edges to make the halves bear properly when together.

I have made cores on these arbors where the sand was $\frac{3}{8}$″ thick over the prickers, and dried the cores thus made in an hour and a half, having to put the cores in the oven but once by this method, whereas they would have to be put in twice if made of hay rope and loam.

Another objection to loam cores is this: They cannot be cast horizontally, and get round holes in large pipes.

FOUNDRYMAN.

Flask-Pins and Hammer-Dies.

Editor American Machinist:

The hard usage to which flask-pins invariably become subject, makes a pin that is not liable to get loose on the flask, a very necessary fixture. The great trouble generally with flask-pins on wooden flasks, that are in continual use, is that they get loose in a comparatively short time. Pins that will shift, always cause more or less trouble, such as bad lifts, or poor joints on castings.

Go into almost any jobbing foundry and watch moulders closing their flasks or copes, and it will be noticed that they keep them either tight around to left or right, or if it is a cope of such dimensions as to need two or more men to handle it, you will most likely hear one of them sing out "to me and run about," for the reason that the flask-pins fit poorly; consequently the moulder has to exercise care in order to get the cope back exactly as it came off. The sketch of pins I send you are the best we ever used. Have used flasks with this style of pin continually for months, and have never had one get loose or shift; as to breakage they will not stand any more abuse than any other cast-iron pin. The sketch shows the pin and mode of fastening so plain that any further explanation is not necessary.

In late issues of the AMERICAN MACHINIST there have been several articles on plans of, patterns for, and methods of moulding "hammer dies." The cut enclosed, showing sectional view of pattern, will be found, I think, as good as any for a rough or finished fit. The dotted lines show dovetails to hold side pieces *A* and *B* to place; to enumerate the different ways of moulding would be to merely repeat, in large part, what has already appeared in these columns. GEO. O. VAIR.

Warsaw, Wis.

Efficiency of Gear Teeth.

Editor American Machinist:

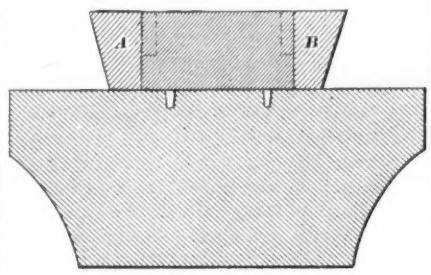
The object of this communication is not to determine the best form of gear teeth, but simply to call attention to some discrepancies in George B. Grant's article on the above subject, in the AMERICAN MACHINIST of Dec. 26, 1885. He has probably overlooked the point to which I refer, and after having his attention called to it, he may correct his investigations, and give us the result some future time, which I hope he will do.

In his analysis, Mr. Grant seems to take into account only the friction at the tooth surfaces. If this was the only point at which power is lost, the problem might be fully as simple as he seems to find it; and we might infer, as he has concluded, that whatever form of tooth be adopted, the power lost, or the efficiency, would be substantially the same.

The element omitted by Mr. Grant is the pressure upon the journal bearings of the gears. This is an important consideration, since the journal pressure *does depend largely upon the form of tooth adopted.* Besides the *form of tooth*, the journal pressure is also affected by the *position of the point of contact.* The friction between the tooth-surfaces has the influence of increasing the journal pressure, while the point of contact moves within the angle of approach, and to decrease the same, while the point of contact moves within the angle of recess. The amount of this increment, or decrement, as well as its direction, continually varies from the beginning to the end of contact. The consideration of these elements will necessarily complicate the analysis very much; but if Mr. Grant will follow the idea to its solution, he will probably have to change his conclusion that "The common opinion among millwrights and the mechanical public in general, in favor of the epicycloid, is a prejudice that is founded on long-continued custom, and not on an intimate knowledge of the properties of that curve."

In speaking of bevel gears (AMERICAN MACHINIST of Oct. 31, 1885), Mr. Grant makes this statement: "If the smaller gear of a pair that are proportioned six to one, is as much as $\frac{1}{32}$ of an inch under size (the outside diameter), the larger gear must be turned $\frac{6}{32}$ or $\frac{3}{16}$ inch under size, and this is enough to change the number of teeth, the proportion and the face, and spoil the work."

The usual way of sizing bevel-gear blanks is to give the largest diameter and angles of face and edges. As these angles are independent of the diameter, they will not be affected by turning the latter too small. Turning the largest diameter too small, therefore, does not "change the number of teeth," but it simply brings the edge nearer to the apex of the cone. The *diameter and pitch* of a bevel-gear vary in such a way as to keep the number of teeth the same, whatever the distance from the apex. As long as the angles are right, it does not matter at what distance from the apex of the cone we cut the gear; the number of teeth will always be the same, and a pair will work correctly if one *is* a little "shorter than the other;" but good practice, or workmanship, requires that the gears be both cut from the cones at the same distance from the apex, measured on the line of contact. We usually obtain this apex distance indirectly by sizing the largest diameter, which is not a necessity, but merely a matter of convenience, in the absence of a better method. This is a bungling and unsatisfactory way of arriving at the desired result; but we shall have to practice it, until we get tools for sizing and cutting bevel-gears in the proper manner.



HAMMER DIE.

With reference to Mr. Grant's article on "Worm Gears" (AMERICAN MACHINIST, May 23, 1885): Applying a little "polishing-powder to personal arithmetic," is the best way of abating the "nuisance" of which complaint is made.

Pawtucket, R. I. C. A. SMITH.

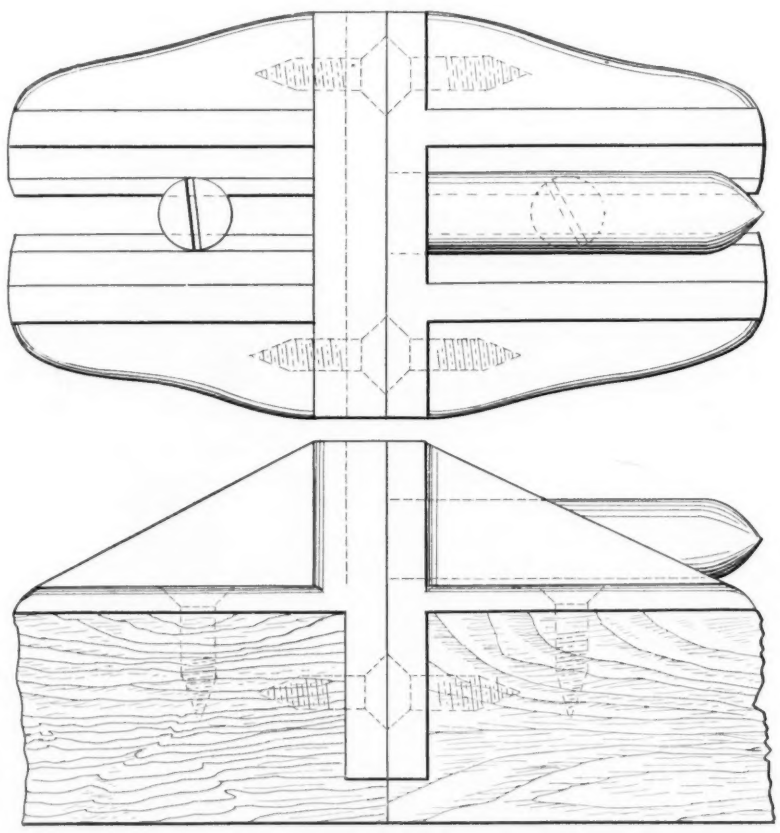
More About Keys.

Editor American Machinist:

I noticed in your issue of November 21st, an article about fitting keys, signed "Gleason," stating that he fits his keys to bear hardest at the center, and chambers pieces to be keyed, and thinks it will be a poorly-fitted key which will throw a piece, so bored, out of true. I would like to ask him if he does not consider it a poorly fitted key which throws any piece out of true? And is chambering the bore of any benefit to a key which only bears on one end? The common practice, I believe, on most small rough work, is to bore pulleys and gears with flat drills and finish with a reamer, which leaves a parallel hole, and if a key is fitted *easy* at the center, and tight at *each end*, I don't see any necessity for chambering, or any reason why it is not a more solid job than it would be if the key had only one small point of bearing at the center.

I have a little gauge which I made to assist in fitting small keys. The idea will, perhaps, be old to many readers, but I trust will be of benefit to some. It is made of $\frac{1}{16}''$ sheet steel about 4′ long, $\frac{5}{8}''$ wide at one end, and $\frac{3}{16}''$ at the other. I finish up the key on three sides; pass the gauge into each end of the keyway; transfer the sizes to ends of the key; file down the top to the taper thus obtained; ease off the *center* a little, and generally have a fit at the first trial if proper care is taken in calipering. W. H. CHAPPELL.

Chicago, Ill.



FLASK PINS.

Steel Boiler Plates.

Editor American Machinist:

Mr. William Kent's remarks in your issue dated December 19th, in relation to steel boiler plates, and the fractured plates of the steam barge Arnold's boiler, are partially correct. With due respect for his opinions, I am inclined to believe that he has stated too decidedly that the practice of "steel boiler plate manufacturers is to keep the carbon below .2 of one per cent.

It is a fact acknowledged by steel makers that the amount of carbon in a steel plate for a given tensile strength, is in proportion to the thickness of the plate; or, in other words, for the same tensile strength a thick plate must have a greater percentage of carbon, than a thin one.

The limit of .2 of one per cent. as given by Mr. Kent, would probably give a tensile strength about 30 tons in a $\frac{9}{16}$ inch plate, but for the same strength in a $1\frac{1}{4}$ inch plate the percentage of carbon would probably rise to .25 or .27 of one per cent.

Mr. Parker, chief surveyor to Lloyd's found (*Engineering*, Vol. XXXIX., page 353) the amount of carbon in a fractured sheet of boiler plate $1\frac{1}{4}$ inch thick of 30 tons tensile strength, to be .33 of one per cent. which is the outside limit mentioned, and which is perhaps excessive, although many boiler plates of this strength and thickness have been sanctioned by Lloyd's surveyors.

The steel used in the Arnold's boiler I believe was of good grade, as shown by the tests in your issue of December 5th. I do not think, however, that such a steel with its large percentage of carbon, which may not be excessive for the thickness, can be used safely for boiler work, unless the greatest attention is given to the proper manipulation of the material.

With steel plates of a tensile strength of 65,000 pounds, and especially those which are under $\frac{1}{2}$ inch in thickness, the many boilers for stationary and marine purposes which have been constructed generally endure the service and sometimes unwarrantable tests. With increased thickness and increased carbon new features are introduced which has led Mr. Parker to conclude "that steel plates more than 1 inch in thickness and having a tenacity of more than thirty tons, must contain so much carbon as to render them unsuitable for boiler-making purposes, although they possess the necessary tenacity and ductility to withstand the usual tensile and cold bending tests."

With Mr. Kent I agree that the rules relating to boiler plates, as formed by the government, are very defective. Steel, under the rules, may be used of very high tensile strength with prescribed physical tests not difficult for the steel-maker to fulfill, but the amount of carbon for a thick plate of such tenacity, is unquestionably and necessarily excessive, and I attribute the few accidents which have occurred on the lakes, either to the very recent introduction of thick plates for boilers, or to the good judgment of the boiler maker, in not using, and manipulating them.

W. L. CLEMENTS.

A Test for Cylinder Oil Wanted.

Editor American Machinist:

There are innumerable firms all over this country engaged in the manufacture and sale of cylinder oils, each one claiming that his particular oil is the superior of any other, that he is desirous of having his oil tested severely in competition with any other, and if his oil is not decided to be superior he will make us a present of a barrel, etc., etc. The writer has been somewhat puzzled to devise a test which will show conclusively the comparative virtues of a half-dozen samples of the best cylinder oils, and when this question has been put to the representatives of prominent oils they have failed to suggest such a critical test as that they will be satisfied and convinced in case they themselves should be defeated. One suggests that five gallons of each kind of oil be tried, and see which one sample lasts longest. In order to carry out such a test on a single engine of 45 horse-power, we tell him a single sample will last us three months, and before we could go around the list once, which would occupy a couple of years, nearly all these companies will be making another oil entirely. In testing two pieces of iron we can pull them alike until one breaks and then pronounce the survivor the stronger, but we can't afford to cut down the oil supply until one of these samples shall ruin our cylinders, and then pronounce it the poorest.

If some one can suggest a plan of making a critical test without the danger of spoiling an engine by seeing how close to zero we can reduce consumption he will do the general public a favor, and probably save the life of many a purchasing agent who is now in danger of being talked to death.

At present the matter of one oil's superiority over another is, we think, largely, if not entirely a matter of opinion or prejudice, and the question is generally left to the judgment of the engineer who has not sufficient refinement of comparison to decide on the merits of the case. INQUIRER.

Cheap Machinery.

We take the following sensible remarks from the *Mechanical World.* They are applicable to any manufacturing country:

"One of the reasons why much of our trade has left us is cheapness. English engineers can turn out better work than the engineers of any other nation if they choose to do so, but the competition which has grown up, during the last few years particularly, has been so severe that a very large, and we are afraid an increasing number of firms, have, in the struggle to make ends meet at low prices

gradually let down the character of their productions until they can no longer be classed even as of medium quality. Manufacturers never make a greater error than when they sacrifice quality, and in severe competition should cease to seek orders which will not pay unless quality be sacrificed, for it is almost axiomatic that a firm's character is ruled, not by their best, but by their worst quality of work, so that, if once a manufacturer stoops to low qualities of work, he is doomed to remain there.

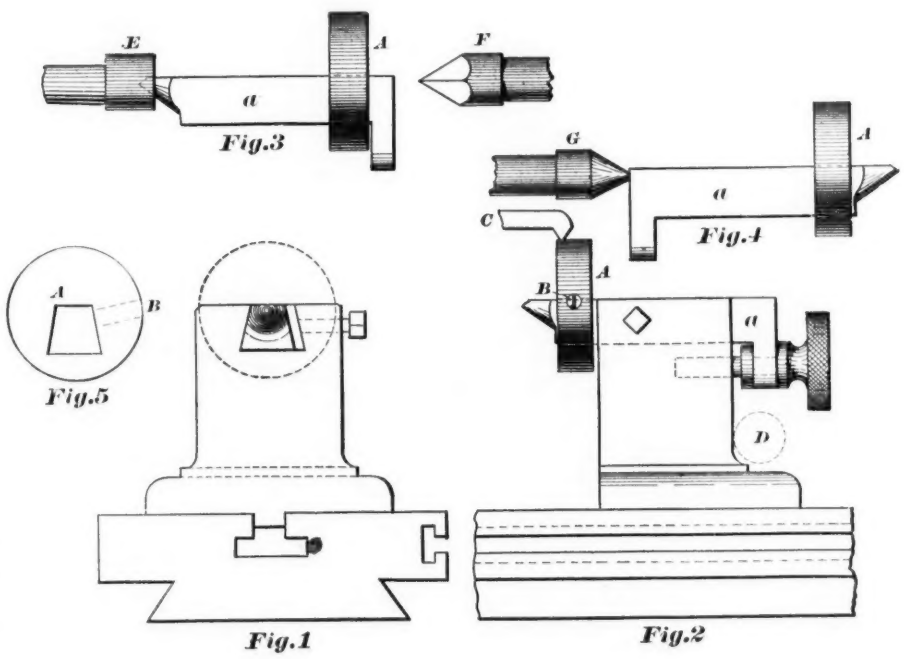
"As a proof of this, is it not a fact to-day that our busiest firms are those noted for invariable good quality? and are not the low-quality men all struggling together in the rush for the poorer class of work? We have known many instances of individual firms who for long were known as one-quality men, and yet who, perhaps, in the push of bad times, have been tempted to take cheap orders. This has been their downfall. The cheap orders have demoralized the men, and the low tone, once entering, is difficult to eradicate, and workmen say to each other, 'Oh! this will do; it's only for such and such an order;' and the result often is that, even with all its cheapness, the article turned out does not even secure as good a quality as its price warranted. Perhaps, if it had been finished no worse than its price, it would have given satisfaction, but it has not been so finished; it has been robbed of its poor birthright, and being, perhaps, sent abroad, it has to compete with the work of the foreigner. Now, the foreigner is just at present putting forth his best efforts to compete with our poor efforts, and, of course, comes off the victor. If English engineers are to hold their own, they must simply do as they used to do, and make the words English, and good, synonymous terms. We are not here finding fault with cheapness, *per se*, for we all know that it is less expensive to build an engine now than it was formerly. We speak now more especially of what may be termed wholesale work, which is reproduced in hundreds. In this class, modern machinery has cheapened production in many ways, and the final price of the manufactured article may legitimately be correspondingly reduced.

Economically, also, it is wrong to employ labor in producing bad articles, for, to put 20s. worth of labor upon the same value of raw material, to result in a 40s. article, is less economical than putting the same labor upon raw material of the value of 30s., for which perhaps 60s. will be finally obtained. It is often said that the wages of foreign nations being less, they are better able to produce cheaply than ourselves. This is, perhaps, true; but it is a fact daily becoming less burdensome to us, for with the spread of knowledge upon the European continent, workmen are becoming more alive to their true position, and shorter hours, with higher wages, cannot long be withheld. It is surprising that such is not even now a more burning question. Even in America, where it might be supposed a knowledge would have, ere this, spread of the short hours of work in this country, we find twelve hours a day to be the rule. We are not amongst those who think that a return to longer hours will be seen. The tendency of the day is to short hours, and if the world's production goes on increasing as it has done of late, the greatest question will soon be, "What is to be done with our productions?" not, "How much can we produce?" [Twelve hours per day in the United States, is a misstatement.]

Skilled Labor *vs.* Brains in Machinery.

By S. W. Goodyear.

In the everyday contact with machines and their products in which there are evidences of work performed, which would be not simply difficult, but impossible of execution by hand is it not the fact that through familiarity there are constantly looked upon as a mere matter of course, many mechanical operations which for a long time, and through a tiresome series of unsuccessful attempts were considered impossible except by the persistent inventor, and possibly his financial backer? Will not these show, if time is taken to investigate, that the brain, the careful thought, which enters so largely into all the best hand work, and keeps pace with the merely physical skill and cunning which fingers may acquire, has here been incorporated with and made a part of machine or method to that extent which almost leads one to ask, can machines think? Do inanimate bodies reason? Shall the answer be yes? If not, why? In the execution of difficult hand labor there is constantly employed a system of reasoning from cause to effect which must closely attend each movement made. Here brain and muscle unite in producing the desired results, but in machinery, in fixtures, and specially devised and arranged methods, there is, when unemployed, simply inert matter. And still, when automatic machines are started up, and the almost endless array of special fixtures and methods to be found in some shops are put to the uses for which they were designed, how much like the closest kind of reasoning is to be seen apparently evinced in every movement made or operation performed. In hand work, brain is incorporated with each individual piece, and with each minute operation. In automatic machines the brain has been put into the machine itself to cover the requirements for all the detail in producing, not simply an individual piece, which shall be good of itself, to be followed by others nearly the same, as in hand work, but to be followed by any number of others exactly alike.



Truing Up Milling Machine Centers.

To illustrate: Let us take from some old roof which has withstood the wear and tear of the years since our ancestors rent, and shaved, and jointed by hand, with scrupulous care, a shingle, and with it the wrought nails which held it in place, and compare them with the machine made shingles of modern times and the now indispensable cut nails with which they are laid. With cleaver and maul, and shaving-horse, and draw-knife, and the jointing-plank, with its keen blade completing the outfit of the shingle maker, whose skill inspired the simple farmer boy, of forty years ago, with wonder and awe, enough shingles could be made in a month to cover the barn and sheds, which would now be supplied from a fraction of a single day's work of a set of modern shingle-making machinery. It required skill and patience, the exercise of good judgment and constant care to make shingles by hand. First to be able to select *trees which would make shingles*. Next to be able at a glance to tell whether the cleaver would run in or run out, and how to manage the rending all the way through so that shaving the shingles to a taper should be as easy as possible, and then to do the jointing, *i.e.*, truing up the edges, so that when laid side by side there should be a reasonably good joint between all that part of the length which was to be exposed to the weather when laid. You need not laugh, it was a good job to make shingles then.

But about the nails. Everybody has seen wrought nails made. No? Well they are made by drawing down the body of the nail when hot on an anvil with a hammer, and cutting the rod nearly off at a point far enough back of the drawn part to furnish material for a head, and thrusting through a heading tool, which admits the body but will not let the head through, a turn of the wrist breaks off the rod, and blows from the hammer complete the head. Simple? Yes; but slightly slow and expensive, and still not long ago all nails were made in this way.

How are cut-nails made? The shingle nails which would be used to-day for the purpose to which these old wrought nails were put, and which show, even now, the bruises from the hammer, and a general uncouthness of form in spite of being half consumed by rust, which it is evident came of the method or lack of method in vogue when they were made, are made by just such a machine as was referred to in the beginning of this letter. A machine with brains. A machine which thinks and reasons, and has a conscience. Don't say nonsense. Look at the machine. See what it will do with the strip of iron which is given into its grip of steel to be subject to its will and pleasure. The strip of iron is the same width plus the amount of iron required from which to form the head of the length expected in the finished nails. Now watch the rapidly succeeding operations by which this ribbon of iron—or steel for nails are made of steel as well as iron—will be converted into nails. A forward motion of the strip carries its end over and just past a shear blade. The mate to this blade comes down and cuts off a tapering piece, the cutting being out of right angles with the length of the strip. The piece thus cut off is seized by jaws of steel, which, acting as heading dies, hold it fast for the header to do its duty, when the finished nail is dropped, to be followed by another. But this is cutting on a bias. If the strip is fed in on a parallel line, with the second piece cut with shear blades in the same position, will it not be a piece of equal width clear across the strip? It would, if the machine did not seem to know that that would not do, and so turns the strip over after each piece is cut, in this way cutting the entire strip into pieces of just the same taper, and pushing forward the strip with a half turn for each forward motion, crunches off with its shear blades, or nail knives of cast steel, or Mushet's special, piece after piece, to be gripped and headed and released. How fast? How many per minute? Two hundred and fifty to three hundred per minute. How alike they are. How admirably adapted to the use for which they are made. And what about the machine which cuts off no piece until the plate has been turned right, and pushed forward just enough to give a piece of the right width and taper, whose header strikes no blow till the heading dies have the piece to be headed firmly in their grip? A machine, in short, in which there is such unerring certainty of action as sets aside all possibility of inattention, or forgetfulness, dishonesty or lack of conscience. But it don't think. Its inventors, and those who have improved upon the original, *did*, though; and, as the rip, rip, crunch, crunch, thud, thud, click, click, from its working, reach the ear, and the rapidly-succeeding motions from its many parts are seen to be always in time and place—always producing exactly the desired effect and no other—does not the conviction force itself upon the mind that, though the inventor, whose sleepless nights, and long, weary hours of keenest mental effort by day, with the entire machine mayhap thrown away, piece by piece, in improving and altering to get it just right, may have passed from this busy stage long years ago, here, in the machine which he bequeathed to his fellows, are still to be seen the workings of his busy brain.

Truing Up and Replacing Milling Machine Centers With Accurate Alignment.

By A. B. Landis.

The tail center of a milling machine is usually constructed as shown in the cut. This center is liable to become broken, as it is somewhat weaker than an ordinary center, owing to provision for room for the milling cutter. Recently an accident occurred to a center of this kind and the question was how to repair it so as to insure perfect accuracy, as it is difficult to do it without some special means. This center had no center-hole at the rear to put on a lathe center, and if it had it would not help me out. The plan I adopted was as follows, which proved to be very satisfactory:

Figs. 1 and 2 show end and side views of the tail center and head, the top of which is channeled out dovetail shape to receive the center. This is parallel with the line of the center, or at least is supposed to be, and it should be. I make a disk or collar, *A*, slot it out to fit this dovetail-shaped center, as shown in Fig. 5, and insert a screw *B* on the side on which the gib is used in the center-head, so as to bring the slot to bear solidly on the side and bottom which bears solidly in the head. I slip this collar on the center, as shown in Fig. 2, and fasten with the screw *B*. I fasten tool *C* in the index-head of the machine by any suitable means, either in the chuck or by clamping, which can be adjusted by driving toward the center or away. Now, I see that the index-head is perfectly square with the table or platen, then by turning the index-head (either by hand or by a belt, if suitable to do so), the tool *C* is revolved around collar *A*, and setting it to proper depth it is turned off perfectly true with the index-head.

To feed the tool across, I fasten the head just tight enough to allow it to slide by a little pressure, and let it rest against the arbor of the machine *D* (shown in dotted lines), and feed the table the same as for milling. Thus I have a collar whose center, when placed upon the dovetailed-shaped tail center, is perfectly central with the index-head. Now, if the point of this center is broken off, make a center *E*, as shown, countersinking deeply. Insert the old center, and slide the collar *A* to the opposite end and fasten and make it to turn in the steady rest of the lathe, fasten back into center *E* by any suitable means, and by the square center *F*, a small center can be bored into the rear end as shown in Fig. 3. Then I slide the collar back again as shown in Fig. 4, and use the regular center *G* in the center just made, and by fastening the center *a* back in it, and collar *A* in steady rest, we are ready to turn or grind the center to proper shape with a positive assurance that it is correct.

This applies equally well when making an entire new center. Then, instead of using the center *E*, I would use the ordinary center and carefully lay off a small center on the end of the blank piece by a divider from the edge of collar, which would be simply used to put a center in the rear with the square center and then by reversing as stated, the center can be turned.

This collar can be laid away with other appliances for the milling machine, and is ready whenever required for speedily repairing, or replacing this center with accuracy.

The center in the index-head it is, apparent, can be readily trued up owing to its being cylindrical.

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Yearly Review of the Machinery Trades.

Once a year it is our custom to ask our advertising patrons to furnish us for publication, in one or two issues, a report upon the business of the year just closing, together with their view of the business outlook for the new year. This custom was inaugurated by us six years ago, and has been received with such favor by the public, that a number of journals have thought the example worthy of imitation.

The present issue contains letters from over fifty representative establishments, whose business relates to the following important departments, viz.: Steam Engines, Boilers, Boiler Tools, Coverings and Appliances, Machine Tools, Machinists' small Tools, Cranes, Hoisting Machinery, Pumping Machinery, Locks and Hardware, Pipe-cutting and Threading Machinery and Tools, Standard Gauges, Measuring Instruments, Twist Drills, Reamers, Wood-working Machinery, Feed-water Heaters, Boiler-feed Pumps, Steam Traps, Steam Hammers, Dredges, Excavators, Pressure Regulators, Saw-mill Machinery, Gas Engines, Drop Forgings, Machinery Castings, Crucibles, Lubricators, Lead Pencils, Drawing Instruments and Materials, Pulleys and Couplings, Gearing and Shafting, Fillets for Pattern Work, Gear Cutting, Tack Machinery, Stitching and Tying Machines, Forming and Bending Machines, Sheet-metal-working Machinery, Railway Repair-shop Tools, Bolt and Nut Machinery, Civil Engineering Outfits, Steam and Gas Fitters' Tools, Wire Pointing Machinery, Turbine Water-wheels, Brass Working Machinery and Packing.

It will be noted that the establishments referred to do not serve local interests merely, but cater to the wants of the machinery trades and the users of power in general, and their united report may therefore be regarded as fairly representative in its character. Enough of the reports touch upon the sombre side of the situation to show that there is still room for improvement in the condition of business. The general drift of the reports, however, is toward marked improvement, and toward the kind of hopeful feeling which makes continued improvement possible. One concern names May, 1885, as the time when the upward lift in the course of their business began, and another establishment names the middle of February as the time when they changed over from eight to ten hours' work per day. The majority, however, seem to agree in naming the early fall as the time when the improvement set in.

Not many of the establishments reporting seem to have added new buildings to their plant during the past year; but minor improvements and new tools have been very generally looked to as important now, and likely to be still more important hereafter, as business continues to improve.

Low prices for the product are complained of very freely, to the consequent detriment of profits; but the feeling seems to be general among all the establishments reporting, that prices have passed their lowest limit, and that whatever change is to occur will be toward higher figures. Probably, the machine-tool trade has suffered rather more severely than most branches during the past two or three years of depression; but one concern in that department expresses a view that we think most experienced observers will agree with, in suggesting to prospective purchasers of machine tools, that it will be to their interest to *buy now*, rather than to wait longer. A number of establishments express themselves as fully recognizing the fact that curtailed earnings, on the part of wage workers, means curtailed sale and production of manufactured goods. Railroad shops are making increased demands upon tool makers, and indications point toward continued improvement in this direction, as the hand-to-mouth policy has about reached its limit in railroad mechanical circles. A number of shops expect to put in more tools, and to increase their working force, while others turn out goods in quantity, with more confidence than heretofore.

A well-known contributor to the AMERICAN MACHINIST once said, in a time of greater depression than has recently existed, that the newspapers of this country have it in their power to make business good at any time, by simply saying business is good, and sticking to it. We think this remark considerably exaggerates the power of the newspapers, except as they voice public sentiment. It is safe to say, however, that, when the general public comes to the conclusion that things have drifted long enough, and that business *ought* to be better, the improvement begins at once. No better indicator as to the views of the manufacturing, commercial and consuming interests of the country can be named, than is to be found in the united experience of machinery establishments.

The business situation may be summed up by saying that it shows a marked improvement in almost every line over the corresponding time last year, while the outlook, as to the better employment of labor, and as to product, prices and profits generalty, is decidedly more hopeful than was the case one year ago.

In view of controversies that have arisen or may arise between the promoters of rival grips, it is proper for us to say that at the time of going to press with the issue containing the article by Charles T. Porter, written at our request, on the mechanical management of the Brooklyn Bridge, we understood that Mr. Porter had no connection with or interest in any form of grip, actual or prospective. In response to an unmistakable public sentiment, the Bridge Trustees have appointed a committee of their own number to investigate existing and proposed appliances, and the committee have opened an office at No. 18 Broadway, New York. We trust that they will reach conclusions that will make the operation of the bridge as safe and efficient as the public have a right to demand—a result the accomplishment of which was the only object we had in view in calling public attention to the subject.

The common use in machine shops of measuring instruments of much greater precision than were used ten years ago, is one of the signs of improvement. Men who then looked upon micrometers as curiosities now use them daily, much as they formerly used a pair of calipers. This is in part due to the fact that fine measuring tools are now furnished at reasonable cost, but mainly owing to the fact that the demand is for better and different work. Fits are made to measure, and sizes maintained in a way not thought possible a few years ago.

Going Ahead.

Good evidence of the value of special knowledge of a mechanical nature is had in the fact that salaries paid to men who have made themselves competent to direct others have, within a few years, increased out of all proportion to the increase of wages of mechanics. Employers fully appreciate the worth of such knowledge, and expect to pay for it. In this there is everything to encourage the studious mechanic. It is an exceptional instance in which a mechanic finds himself, by study and observation, in the possession of knowledge beyond his immediate requirements, that he does not find use for it to his own profit. Mr. Bingley's statement, on another page, to the effect that if a young man in a railroad shop fits himself for a higher position he will get a "*call*," is very true and to the point. Doing the work well in which one is engaged, and at the same time fitting one's self for doing something higher, is the only sure road to permanent advancement. A little patience is sometimes required. Advancement may not always be as speedy as could be desired, but it is reasonably sure to come. Sometimes a man may be impatient, knowing that he is competent to fill a better position than he is filling. In this case he is apt to neglect present duties. This is always a wrong course, because it is certain to stand in the way of going ahead.

In the experiments with balloons, which have for some time been going on in France, the power necessary for giving direction to the car has been had by means of electricity. Now it is said that a steam-engine has been substituted.

Good Engines and Cheap Engineers.

Builders of steam engines who have been at pains to simplify construction, frequently state as a special inducement to effect sales, that skilled engineers are not required to handle their engines. This may, in a certain sense, be true, but it is a question if such statements do not in the end work injury to the builder as well as the user. Generally speaking, and especially if, as is usually the case, boilers form part of the plant, a skilled engineer is required, not only for the credit of the engine, but for economy and safety as well. Many good engines have been ruined by unskillful management, and this equally to the discredit of the builder and the loss of the user; boilers in the hands of those unacquainted with their care are not only dangerous magazines, but it requires skill to bring about economy in their use.

Some engines require less attention than others; this the skilled engineer will appreciate, and give due credit for. But with any engine, keeping it running satisfactorily and at little expense in the way of repairs and deterioration, is largely a matter of doing the *little things* that are required at the proper time. The packing that is allowed to blow scores the rod, which is henceforth kept packed at increased cost in friction, and more rapid wear. The journal that is allowed to run loose soon puts itself beyond the possibility of being properly held. The cylinder that gets cut, goes on wasting steam indefinitely, and so with a dozen other things. Properly attending to these things is work for the skilled engineer, and just as essential in the case of the engine that does not require much looking after as in the case of one that requires a good deal of attention.

Instead of trying to lower the standard of engineers, efforts should be in the direction of raising it. Engine builders can help in this matter, and will find it for their own interest as well as that of their customers to do so. Let the argument be anything rather than that anyone without education in that direction is capable of properly caring for a steam engine. It is quite as reasonable to say that a man who could shovel gravel satisfactoril ywas competent as a machinist.

The *Northwestern Miller*, Minneapolis, Minn., has treated itself to a Christmas overcoat, the front of which is artistically decorated with a view of Don Quixote fighting the traditional wind-mill, and supported by his trusty squire, Sancho, the presentation being doubtless intended to suggest the superiority of modern milling methods. The number contains much interesting reading matter.

Schemes with a paternal leaning for the welfare—so-called—of workingmen do not seem to prosper in this country. Some excellent people wonder why mechanics do not take kindly to villages built expressly for their accommodation, and generally come to any but the right conclusion as to why they do not, The true reason is, that there is no such thing in this country as a working "class," as distinct from a "class" that does not work—except it be a distinction between reputable citizens and loafers—and efforts of the kind referred to are, to a certain extent, based upon the assumption that there is such a class. The carrying out of the idea that mechanics and others who work for daily wages should be set apart by themselves and live under a species of tutelage any more than that doctors, lawyers and ministers should, is affirming a distinction that does not exist, and independent workingmen are likely, and quite properly so, to object to it. The feeling that as a citizen one is subject to regulations other than those imposed by law on all alike, is not a pleasant one. The tendency of such a course in a country where there is no "ruling class" is likely to be mischievous; we cannot see any grounds upon which to commend it.

The locomotive engine John Bull, which was sent to this country in 1835, has been presented to the National Museum by the Pennsylvania Railroad Company, and placed on exhibition in Historical Hall.

Our best machinery manufacturers sell machinery on its exact merits; they find no use for extravagant words in which to state the good qualities of what they sell. It would be better if all connected with the manufacture and sale of machinery adopted this course. Extravagant promises usually defeat the end in view; too much is known in a general way of the possibilities and impossibilities of mechanics, to permit of their having any weight in the desired direction. They damage the one who makes them, and unfortunately they work injury in another direction. If a man really makes substantial and somewhat phenomenal progress in some direction, he has difficulty in introducing what he has perfected from the fact that his device is likely to be judged on the basis of extravagant promises. A plain statement of facts is, in the end, the best.

Foundries and Manufacturing Establishments.

There are almost always other questions entering into running foundry business in connection with manufacturing than that of profit or loss in the foundry. Often the getting of castings as they are wanted and when they are wanted, is of importance enough to overbalance what would otherwise be a positive loss, or a failure to make any money in the foundry part of the enterprise. This matter of convenience is a hard one to fix a money value upon, and will probably not appear anywhere in the account system, but it is important, and should have weight in determining the advisability of adding a foundry to a machine shop or manufacturing plant.

A good many manufacturing establishments are building brass foundries. This is frequently done mainly as a matter of convenience, but there is another way in which the subject should be looked at. Suppose a good many castings are used, of a character to require very accurate turning to sizes and shapes. For this purpose gang cutters are used, which are costly to fit up, but which if carefully used will last almost indefinitely. If the castings are bought outside the chips will generally be sold back at a little less than half the price of the castings. Manifestly the patterns must be made with the least admissible finish allowance, to avoid as much as may be the loss as between the price of chips and castings. But the loss of expensive cutters by contact with scale must be avoided. The end is a species of compromise, resulting in spoiling too many tools, and in losing too many castings to avoid spoiling tools, besides extra care and watchfulness that take time, making the work in the cost higher than if more liberal allowance for finish were made; at the same time there is always the uncertainty as to whether, as a matter of dollars and cents, under the circumstances, the allowance should be increased or decreased. The situation, where a good many castings of this kind are used, is between two fires, as it were.

When the brass foundry is owned and run by the munufacturer, the argument is; that with an ample finish allowance, the only increase in the cost of castings will be that due to the slight loss in, and cost of melting, and that this will be a good deal more than overcome by increased production in the machine shop, and the fact that less care and skill will be required in working the castings, that less will be returned to the foundry, and that the cost of keeping up special tools will be less, and the average of the work done by their use more satisfactory.

Considerations somewhat similar to the above will frequently apply to the iron foundry, especially in connection with shops where considerable work that is not regular, as in large jobbing shops, is done. Frequently it would be a convenience, especially in some kinds of lathe work, to have considerable stock left unused, that eventually finds its way back to the foundry. When castings are bought outside and this waste sold back; this is expensive, and must generally be avoided, even at considerable sacrifice in the way of convenience; in other words, it can frequently be done at advantage to the machine shop, and to the saving of pattern work—that is at less total cost—if the foundry is part of the general plant, when there would be a loss if the castings were paid for at the regular price outside, and the waste sold back at usual rates. These conditions do not, however, probably exist to the same extent in the instance of an iron foundry that they do in that of the brass foundry. But in either case the subject has more in it than appears on the face. While the foundry, either brass or iron, may not show a profit on the books, it may be an important factor in determining the general profits of the business. On the other hand the foundry of a manufacturing plant may show profits much beyond what it should in strict justice be credited with, owing to judicious general management, that looks for final and general rather than special results.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(20) W. H. D., Leominster, Mass., asks: 1. Will sperm oil injure nickel-plating if allowed to remain on it for some time? *A.*—We do not think it will injure it. 2. What is meant by charcoal iron? *A.*—Iron made by the use of charcoal fuel.

(21) C. N. S., Philadelphia, Pa., asks: Will an eight-horse engine drive one 30″ × 30″ planer, one 26″ lathe, one 13″ swing lathe, one medium size drill press, a grindstone and forge-blower? *A.*—Yes; it will be ample, with proper arrangement of tools.

(22) N. T. R., Olney, Ill., asks: Can you tell me of a good solution in which to temper mill picks. I can get them hard enough, but want something to toughen them? *A.*—The following is sometimes used for this purpose. We cannot say that anything will toughen the steel: 2 galls. rain water; 1 oz. corrosive sublimate; 1 oz. sal-ammoniac; 1 oz. saltpeter; 1½ pint rock salt. Heat and harden without drawing temper. Many prefer heating in a lead bath.

(23) B., Litchfield, Conn., asks: 1. Will there be very material difference in the amount of friction between two eccentrics having the same throw and doing the same work, but one having a diameter 50 per cent. greater than the other? *A.*—No. 2. What advantage has an eccentric over a crank in moving a valve when a separate shaft is used for driving the valve? *A.*—An eccentric has the advantage of a larger wearing surface than the crank; but, otherwise, a crank would answer about as well. 3. Would there be any value in a riding cut-off valve somewhat similar to the Buckeye, but with a quicker cut-off and less friction in moving the cut-off valve? *A.*—As we understand the question, yes. A minimum friction and a quick cut-off are always desirable. 4. If I were to send you a description of the valve to which I refer, would you tell me—without inserting the description—whether you think it worth patenting. *A.*—No; but we would reply by mail, giving the desired information.

(24) E. T. M., Reading, Pa., asks; 1. When water freezes in pipes, is it the expansion of the water alone that bursts the pipe, or is it partly the frost in the metal of the pipe? *A.*—It is simply the expansion of the water during the act of freezing. 2. Does frost weaken metal, and to what extent? *A.*—Possibly cold may weaken metal, but not much; we never heard of any experiments to determine exactly how much. 3. Why do springs and railroad iron seem to break oftener during severe periods of frost? *A.*—It is doubtless due to the increased rigidity of all the parts with which the broken metal come in contact. 4. Does it require a lower temperature to freeze spring water than surface water? *A.*—No. 5. Why do we seldom see springs frozen? *A.*—Because the water cannot instantly part with its heat, which is comparatively great, coming, as it does, from the warm ground, perhaps hundreds of feet beneath the surface. The water freezes after it has become cooled down to 32 deg. Fahr.; in the meantime, it has run some distance from where it came out of the ground, thus always leaving a space of open water. 6. When little puddles of water freeze on the surface of the ground, we break the thin shell of ice upon them and find an air space beneath; what is the cause of this? *A.*—It is caused mostly by loss of water through the ground. 7. In putting up 6″ steam pipe in a mill, is it best to drain the water of condensation toward the engine, or toward the boiler? *A.*—Toward the engine. 8. Does a steam-engine cylinder need more lubrication when using steam at 140 lbs. pressure per steam gauge, than when using steam at a pressure of 40 lbs.? *A.*—Yes.

Business Specials

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

T. M. Parker, Steel Stamps, Stencils, Hart'f'd, Ct.

J. Clayton, Air Compressors, Rock Drills. 43 Dey st, N.Y.

Edw. Sears, wood engraver, 48 Beekman st., N.Y.

Steel Name Stamps, &c. J.B. Roney, Lynn, Mass.

Tack, Wire, and Shoe Nail Machinery; Wm. A. Sweetser, Brockton, Mass.

Steel shank, wire nail, shoe nail and tack machinery. Keith & Trufant, Campello, Mass.

Tack and Wire Nail Machinery, made by the Willets Mfg. Co., Providence, R. I.

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

Light articles built to order by the American Sewing Machine Co., Philadelphia, Pa.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

Patent attorney and expert. Machine designs and details. Wm. H. Weightman, 82 Astor House, N.Y.

Foot-Power Machinery for workshop use, sent on trial if desired. W. F. & Jno. Barnes, Rockford, Ill.

Lyman's Gear Chart. How to lay out gear teeth. Price, 50c. E. Lyman, C. E., New Haven, Conn.

Drop presses, and other special tools, manufactured by Williams, White & Co., Moline, Ill.

Improved Labor-Saving Upright Drills. 20 in. to 36 in. inclusive. Currier & Snyder, Worcester, Mass.

Selden Packing for stuffing box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., N.Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocum & Son's Shafting Works, Drinker st., Philadelphia, Pa.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large; prices low. Frasse & Co., 62 Chatham st., N. Y.

E. Merritt & Co., Brockton, Mass., established 1859, only manufacturers of a complete line of Tack and Nail Machinery. Send for circulars.

Files recut without drawing temper, about one-half usual prices; samples recut free; prices on application. The Acme Co., Collinsville, Conn.

Curtis Pressure Regulators, Curtis Return Trap, Curtis Damper Regulator. See Jan 2, p. 13. Send for circular No. 17, Curtis Reg. Co., Boston, Mass.

"Complete Practical Machinist," $2.50; "Mechanical Drawing Self-Taught;" $4. Books for workmen. Joshua Rose, Box 3306, New York City.

Kellam's Pressure Regulator—used in heating system of 11-story building, Madison ave., N. Y.,—saved, last season, $2,000 over previous season. Hine & Robertson, 12 Cortlandt street, New York.

Manufacturers in United States desirous of starting a branch of their business in Canada to advantage, please address for further information, R. Drummond, Sec'y Board Trade, Stellarton, N. S.

Locomotive Engine Running and Management. By Angus Sinclair. Gives full directions about handling and repairing locomotives; instructs how to design valve gear and set valves; Westinghouse air brake explained by aid of engravings. Price, $2. For sale by *National Car Builder*, 187 Dearborn st., Chicago, Ill

Every young man who aspires to be either a mechanic, merchant, or manufacturer, owes it to himself that he become thoroughly familiar with the writings of Chordal. John Wiley & Sons, 15 Astor Place, N. Y., have issued a new and enlarged 12 mo edition of "Extracts from Chordal's Letters." Handsomely bound in cloth, with over 50 illustrations. Price, $2. Discount of 25 per cent on orders for five or more copies

Manufactures.

Geo. H. Raymond, Saccarappa, Me., is fitting up a wood-working establishment.

The Covington & Macon R. R. Co., contemplate a cotton compress at Covington, Ga.

The Putnam Tool Co., Fitchburg, Mass., are building an addition to their works.

The Ohio Falls Car Co., of Jeffersonville, Ind., resumed operations on the 1st of January.

The Eames Vacuum Brake Co., are fitting up more shop room and putting in more tools.

The Birmingham Rolling Mill Co., Birmingham, Ala., contemplate putting in a $50,000 muck mill.

A. V. Gude, contractor, Atlanta, Ga., is about to build water-works for the town of Covington, Ga.

The Cooke Locomotive Works, Paterson, N. J., have recently started up their machinery department.

Smith's Sons Gin and Machinery Co. have just commenced erecting buildings in Birmingham, Alabama.

The works of the Link Belt Machinery Co., Chicago, Ill., which were burned Dec. 21, will be immediately rebuilt.

The Chattanooga Chair Co., Chattanooga, Tenn., will add new machinery to their factory, and have doubled their capital stock.

A company has been organized at Grafton, Mass., with $30,000 capital, to supply the village with water from Misco Brook.

J. B. Woodworth, Worcester, Mass., is preparing plans for a pumping station at Montgomery, Ala. A. H. Howland, also of Worcester, is engineer of the project.

Jacob Schroyer will at once commence work on buildings, etc., for mining coal at Maple Summit, (Mill Run P. O.). Hoisting machinery, etc., will be wanted. *New Enterprise.*

Hon. Wm. L. Gilbert, of Hartford, Conn., president of the Connecticut Western Railroad, proposes to erect buildings for an educational institution at Winsted, Conn., at a cost of $100,000 or more.

The Gilkerson Machine Works, Homer, N. Y., have issued an illustrated catalogue descriptive of planer vises, and hardened parallel pieces made at the works. They manufacture special machinery and tools.

The Southern Bridge Company has been incorporated at Birmingham, Ala., with $25,000 capital, and an authorized increase to $100,000. It proposes to make iron and wooden bridges and iron fences.—*Railway Register.*

The erection of a co-operative foundry at North Dighton is the outcome of the strike. The building has been commenced, and it is expected the shop will be in running order by April, and will accommodate 15 or 20 moulders.—*Boston Commercial Bulletin.*

O. E. Hausburg, 71 Nassau street, New York, has the agency for the sale of the standard watchman's clock, formerly known as Buerk's. By permission from the Waltham Watch Co., the "center pinion" has been added to this clock, which prevents any damage to the movement in case the mainspring breaks.

After January 1 it is expected that there will be a change in the manner of working crews of the Edgar Thomson Steel Works, of Pittsburgh, Pa. There will be three crews working eight hours each, instead of two working twelve hours each. The mill is turning out 700 tons of rails per day.—*Chicago Journal of Commerce.*

James W. Cooper, Seventeenth street and Washington avenue, Philadelphia, Pa., will rebuild his furniture factory which was burned Dec. 17. The buildings formerly occupied a space of 50′x100′, which, with side wings, gave them a frontage of 150′ on Washington avenue. It is understood that the new buildings are to cover more ground than did the old.

The cylinder lubricator which we illustrated last week, is manufactured by the Harlow Lubricator Company, Brockton, Mass., of which the inventor, C. C. Harlow, is the general manager. The shop is devoted exclusively to this purpose, and is fitted up with approved special tools. We are informed that business is very brisk with them.

A syndicate, consisting of Hon. J. R. Bodwell, of Hallowell, Me., and Portland and Boston parties, have purchased a controlling interest in the Augusta Water Company, and propose next season erecting extensive works above the dam, and putting in large mains on both sides of the river to supply the city. The Holly will be the system used.—*Industrial Journal.*

The newly-organized Detroit Iron and Pipe Company, which, last week, secured the contract for furnishing the Detroit, Mich., Water Board with about $75,000 worth of pipe, is putting up extensive works at Grand Trunk Junction, and will commence the delivery of pipe in February. One hundred men will be employed on the present contract, and the force will be increased to about double that number in the spring.—*Detroit Free Press.*

According to a press dispatch, active preparations are being made by the syndicate which lately purchased the old Government gun factory and armory at Harper's Ferry, Va., to erect large manufacturing establishments as soon as spring opens. James D. Butt, the attorney for the syndicate, says: "I feel confident that in the next five years Harper's Ferry will have a population of 30,000, whereas now there are barely 2,000 here. The capitalists I represent are fully awake to the value of their property, and will develop it to the fullest extent. They claim that from the rapids of the Potomac and Shenandoah they can get 6,000 horse-power, and to hook that power to machinery will give employment to many men. We have abundant capital, and are here to stay."

From the Pickaway Machine Works, Circleville, Ohio, we have some particulars regarding the establishing of the straw-board business in that town. A bonus of $30,000 was raised about two years ago by the citizens in response to a proposition made by the Portage Straw Board Co., of Akron, Ohio, to locate the headquarters of their extensive business in Circleville. The result was to quicken the old city into new life, by establishing what is now the largest straw-board factory in the world. The money invested is $500,000, four-fifths of this having been expended before a wheel was turned. The location comprises an area of over fourteen acres on the banks of the Scioto River. The immense structure is of brick, with slate roof, rendering it fireproof from the outside. The main building is 541×192 feet, and there are 11 rotaries or bleachers, 14′ diameter, spherical, 5/8″ thick boiler iron. The boiler-room is 104×75 feet, occupied by four batteries of double boilers of the Babcock & Wilcox type, representing 1,500 H.P. The engine-room is 172×136 feet, containing seven distinct engines of the Reynolds-Corliss type; four of these are 75 H.P. each, one of 125 H.P., one of 700 H.P.; also a large double fly-wheel pump, with capacity of 4,000,000 gallons per day, for fire purposes. There are automatic sprinklers inside, in case of fire; the electric light is used throughout the building, furnished by dynamos in the engine-room. Twenty-four hours per day is the time run. Capital stock of company is $1,000,000, with O. C. Barbour, of Akron, president, and A. McFarland, secretary and treasurer. The general manager of the works is John L. Laplin.

The Springfield Glue and Emery Wheel Co., Springfield, Mass., write us: "We have lately enlarged our works, put in a number of new machines, and increased our capacity one-third. Orders are coming in freely for our knife-grinders and emery-wheel tool-grinders, so that we are crowded with work.',

Press dispatches convey the intelligence that the old Sharpville (Pa.) furnace has just been blown in, after lying idle for two years. The Joliet Steel Company has made a contract to take all the iron the furnace can produce, and this means a long and steady run. The Douglas furnace, in the same place, has also been put in blast.

Machinists' Supplies and Iron.

NEW YORK, Dec. 30, 1885.

The market is not yet settled in regard to next years' prices, although one or more producers have announced that they will sell for 1886 at prices which have been current during the past few weeks.

Iron—In American pig, the prices are lower than have been expected. The market is very even and steady, and holds firm. Standard Lehigh and North River brands being obtainable at $18 to $18.50 for No. 1 X Foundry; $17 to $17.50 for No. 2; and $16 to $16.50 for Grey Forge, tidewater delivery.

Scotch Pig—The market has been dull and without quotable change. We quote Coltness, $19.50 to $20; Glengarnock, $18.50 to $19 to arrive; Gartsherrie, $19 to $19.50; Summerlee, $19 to $19.50; Eglinton, $17.50 to $18; Langloan, $19.50, and Dalmellington, $18.25.

Lead—Dull, but a firm tone still holds. Spot, by car-load, 4.65c. to 4.70c.

Copper—Quiet, with no quotable change. Lake, 11¼c. to 11½c. cash; for February, 11.50c.; March, at 11 55c.

Tin—Market firm. Jobbing lots Banca, 21½c; Straits and Malacca, 20 80c., cash.

Spelter—Quiet and steady; refined 5¾c. to 6c.

Antimony—Hallett's, 8¾c. to 8¾c.; Cookson's, 9.45c. to 9.50c.

WANTED

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Wanted—Situation by experienced draftsman; competent; reliable. Address K., AM. MACHINIST.

Traveler wants engagement to push special tools, manfrs. supplies, etc. Expert, care AM. MACHINIST.

A salesman to canvass for steam and belt power elevator, New York City and vicinity; New Yorker preferred; should be a mechanic. Address F. D., AM. MACHINIST.

Wanted—Foreman for boiler and plate-iron works; one that is correct in his work and ability to govern men; reference required. Address, J., AM. MACHINIST.

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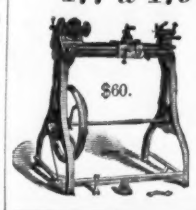

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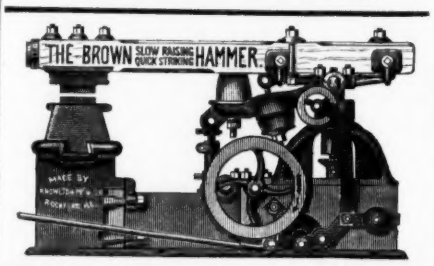

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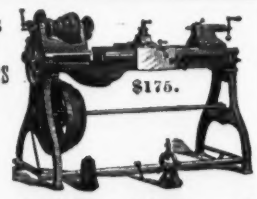

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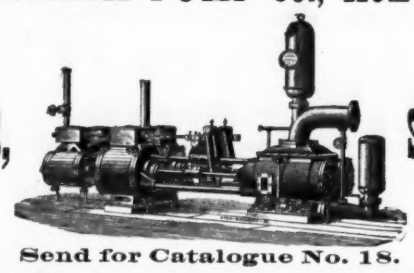

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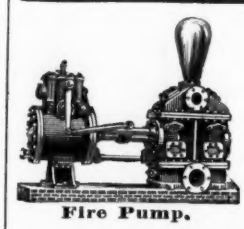

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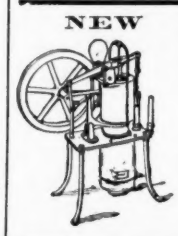

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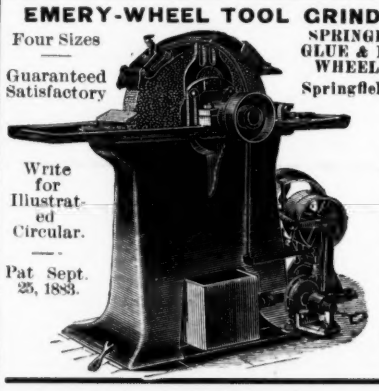

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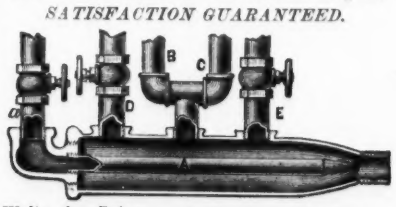

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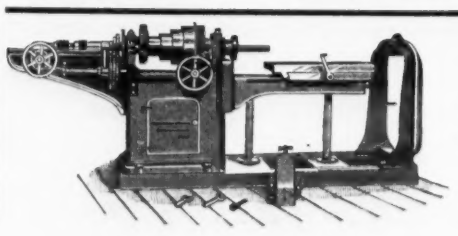

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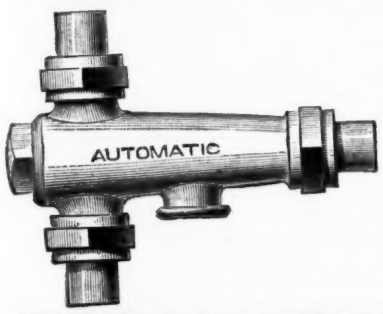

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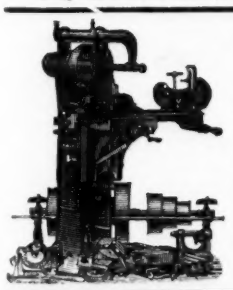

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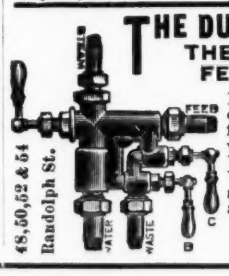

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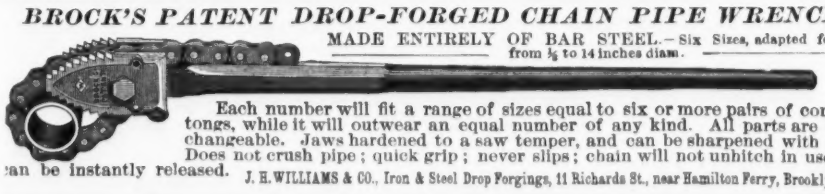

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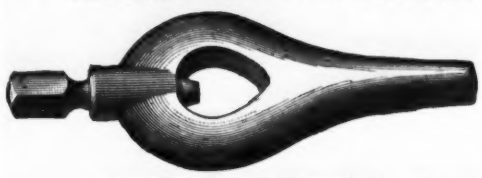

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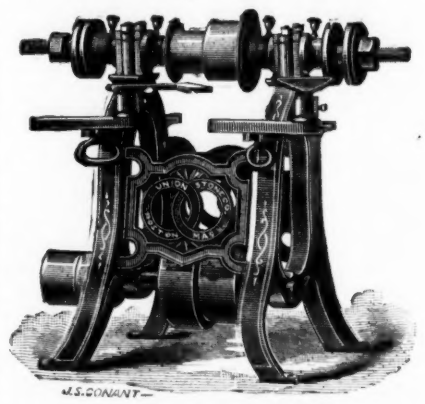

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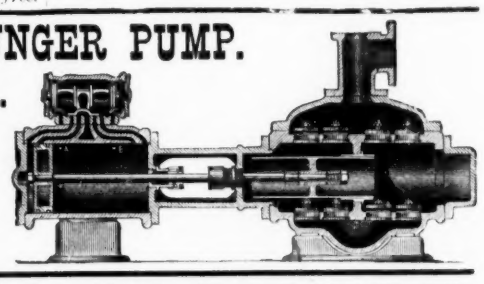

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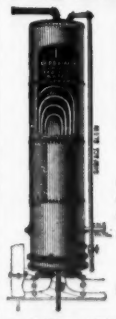

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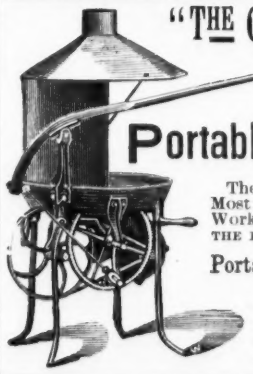

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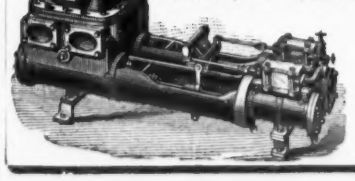

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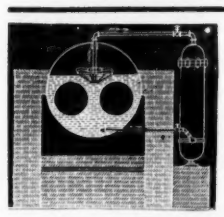

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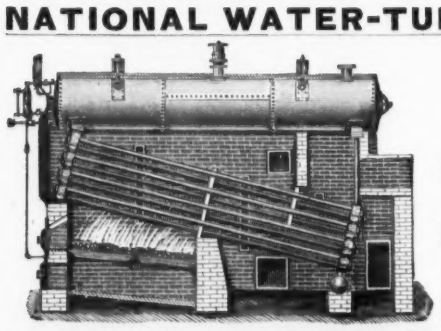

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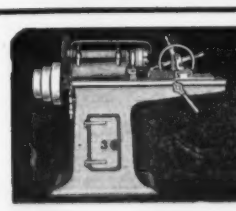

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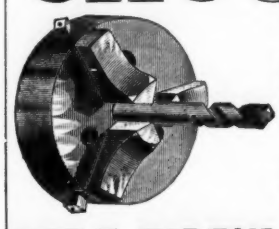

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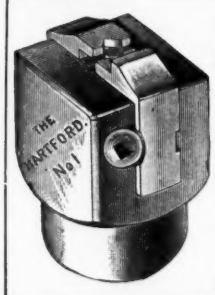

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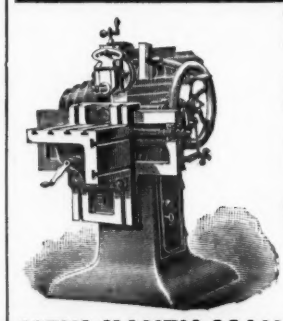

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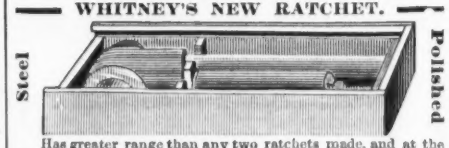

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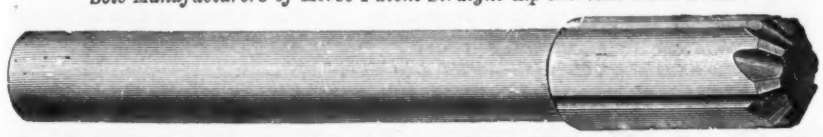

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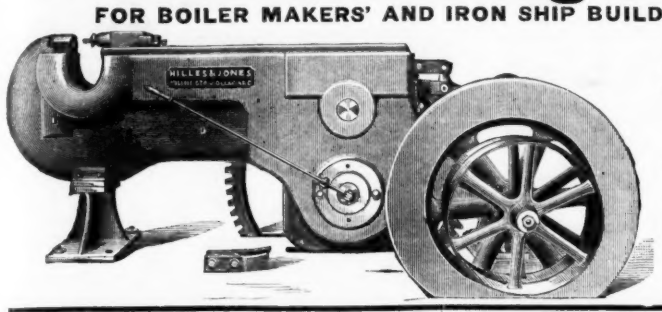

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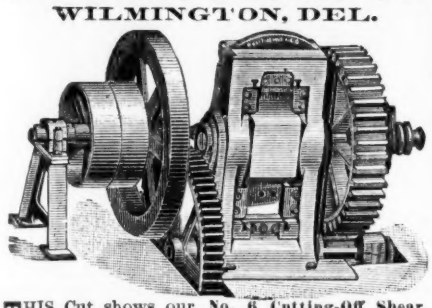

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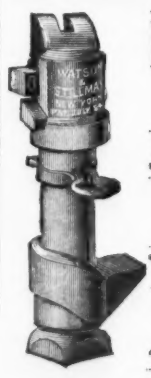

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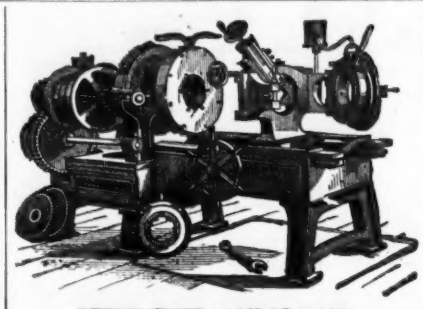

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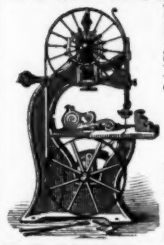

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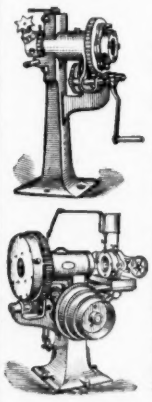

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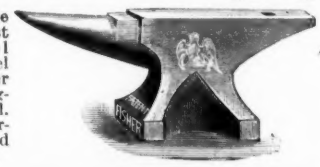

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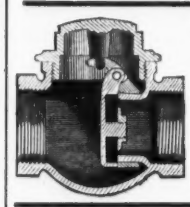

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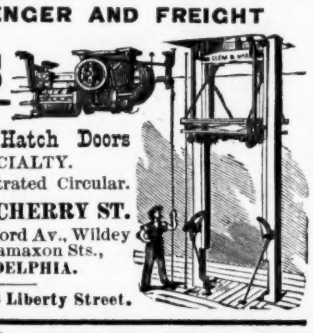

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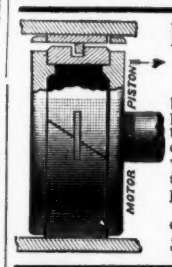

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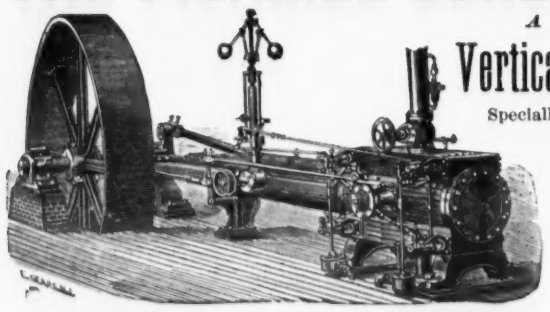

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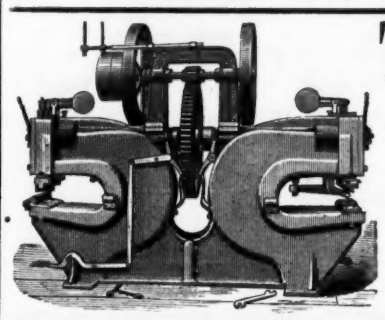

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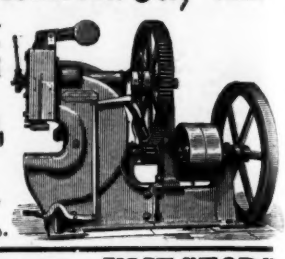

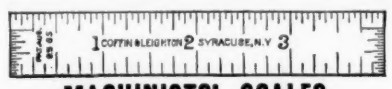

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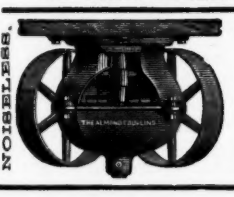

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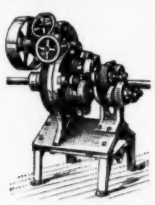

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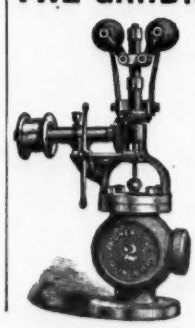

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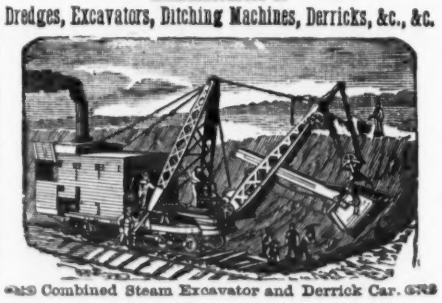

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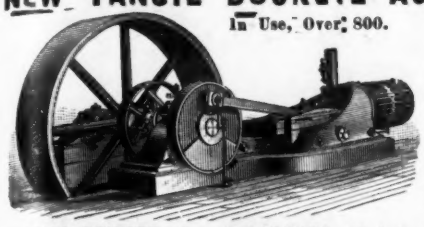

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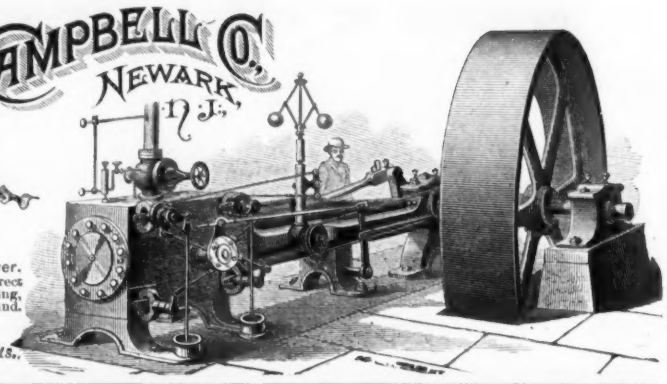

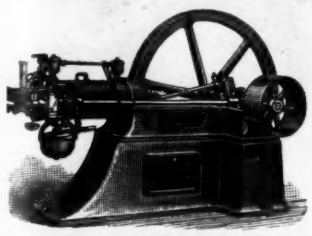

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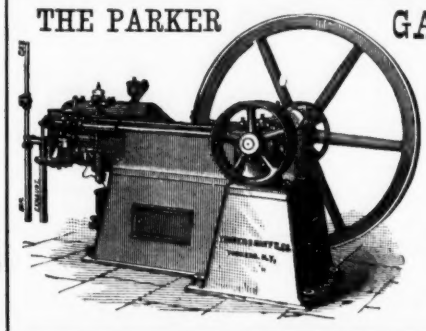

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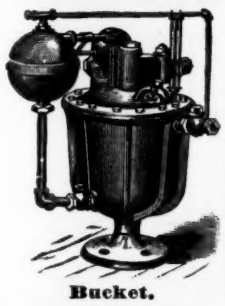

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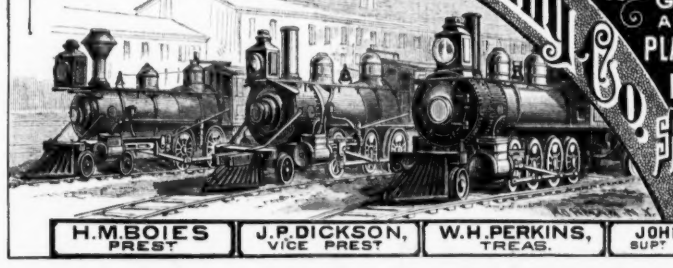

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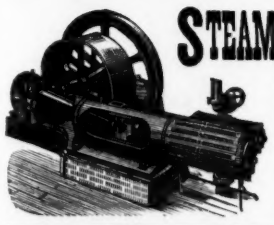

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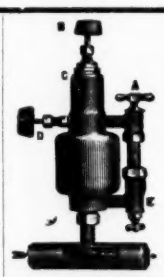

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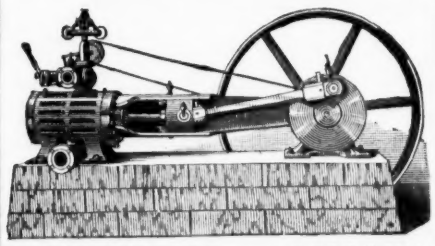

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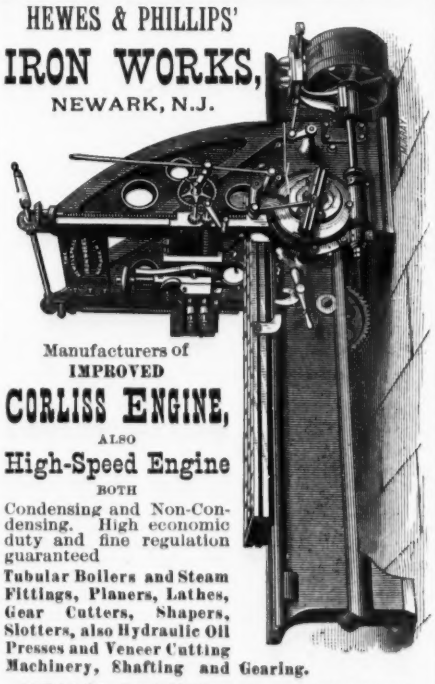

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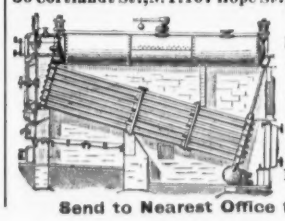

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MACHINERY AND TOOLS

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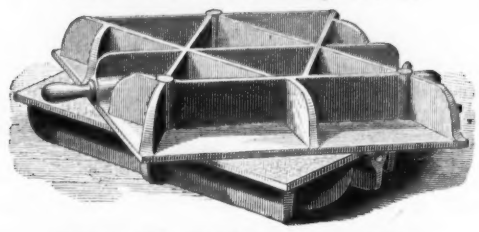
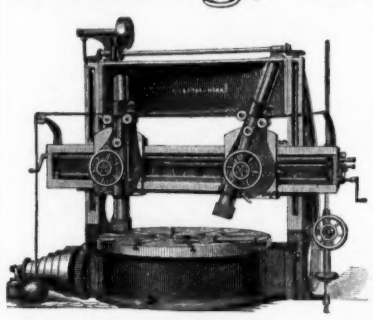


SIZES OF SURFACE PLATES.

4½ in. x 6 in.	9 in. x 9 in.	12 in. x 12 in.	16 in. x 16 in.
6 in. x 6 in.	9 in. x 14 in.	12 in. x 18 in.	18 in. x 18 in.
6 in. x 12 in.	10 in. x 15 in.	14 in. x 14 in.	18 in. x 36 in.
6½ in. x 18 in.	10 in. x 30 in.	14 in. x 18 in.	24 in. x 24 in.
	36 in. x 66 in.		

Illustrated Catalogue Mailed on Application.

Boring and Turning Mills,



5, 6, 7, 8, 10, 12, 14 and 16 FT. SWING.

NEW MACHINE,

14—20 ft. Boring and Turning Mill. Housings and upper works arranged to slide back to take in work 20 ft. diameter. Has independent boring and key seating attachment.

NILES TOOL WORKS

Hamilton, Ohio.

PHILADELPHIA, 713 CHESTNUT STREET. | CHICAGO, Gaff Building, La Salle St.

Weston-Capen

FRICTION CLUTCHES and PULLEYS.

Made wholly of metal—No wood or leather surfaces. Entirely free from Collar friction or End thrust. Run without noise, and without loss of power in driving. Friction Surfaces are of flat sheet metal, easily renewed.—Adjustments are simple, easily made and positive; easily applied, the working parts all attached to a Central Sleeve.

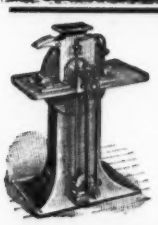
Descriptive Circulars and Prices on Application.

SOLE MAKERS:

THE YALE & TOWNE M'F'G CO.,

STAMFORD, CONN.

NEW YORK, 62 READE ST. | BOSTON, 224 FRANKLIN ST. | PHILADELPHIA, 15 N. SIXTH ST. | CHICAGO, 64 LAKE ST.



The Stiles Machinist Tool Grinder.

FOR GRINDING LATHE, PLANER AND OTHER TOOLS.

—MANUFACTURED BY—

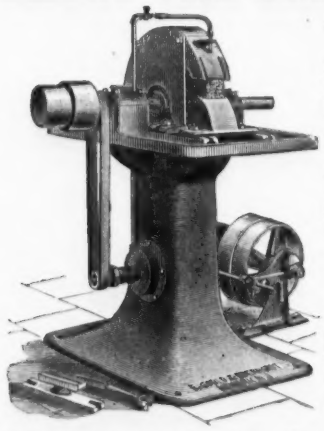
THE STILES & PARKER PRESS CO.

MIDDLETOWN, CONN.

Branch Works and Office:

59 DUANE STREET, NEW YORK.

EBERHARDT'S EMERY TOOL GRINDER



Will not draw the Temper. Will ship on its Merits.

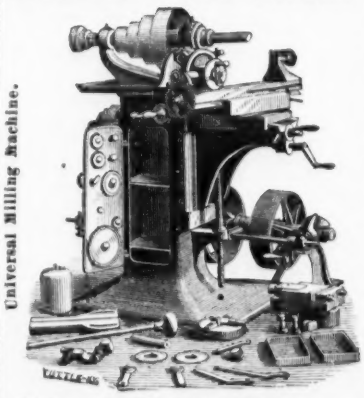
Write to E. Gould & Eberhardt

97 to 111 N. J. R.R. Ave., Newark, N. J.

E. E. CARVIN & CO.,

MANUFACTURERS OF

Machinists and Iron Workers' Tools



Universal Milling Machine.

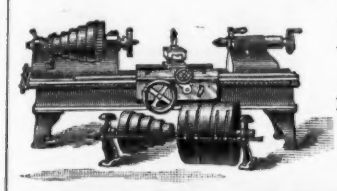
WE RECEIVED GOLD MEDAL FOR OUR NEW UNIVERSAL MILLER AT NEW ORLEANS EXPOSITION. (see ut)

Lathes, Planers, Milling Machines and Drills. Special Tools for all kinds of manufacturing to order. Ge[illegible] and Rack Cutting, Milling and Index Drilling to order.

Nos. 139 to 143 CENTRE ST., NEW YORK.

THE PRATT & WHITNEY CO.,

HARTFORD, CONN.,



Manufacture LATHES of Various Sizes

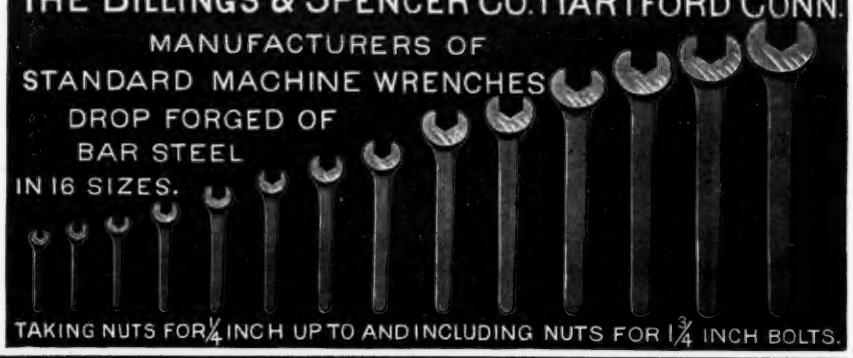
AND OF THE FOLLOWING KINDS:

HAND, ENGINE FOR TURNING AND SCREW CUTTING, CUTTING OFF, GAP BED, PULLEY TURNING AND BORING, TURRET-HEAD ENGINE AND CHUCKING, HAND WHEEL, RIM TURNING, SPINNING, GRINDING, PATTERN MAKING, &c.

Price List and Description Given upon Application.

THE BILLINGS & SPENCER CO. HARTFORD CONN.

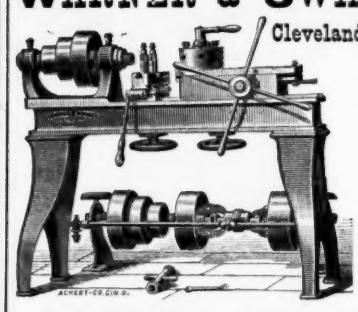
MANUFACTURERS OF STANDARD MACHINE WRENCHES DROP FORGED OF BAR STEEL IN 16 SIZES.



TAKING NUTS FOR ¼ INCH UP TO AND INCLUDING NUTS FOR 1¾ INCH BOLTS.

WARNER & SWASEY,

Cleveland, Ohio.



BRASS WORKING MACHINERY.

Illustrated Catalogue on Application.

GEO. W. FIFIELD,

Manufacturer of ENGINE LATHES from 16 to 46 in. swing. Quick, Photographs and Prices furnished on application.

Lowell, Mass., U. S. A.

GEAR WHEELS and GEAR CUTTING.

Gears cut or made to order. Of every kind, spur, bevel, worm, rack, ratchet, internal, etc. Of any size, from a quarter-inch to six feet diameter. In any material. In any quantity. Small gears on hand for free delivery by mail. Send for illustrated price list.

GEO. B. GRANT, 96 Beverly St., Boston.

KEY SEATING MACHINES AND 20 in. Drills a specialty.

Our 20 in. Drill is a heavy substantial tool, made for service, has steel shafts and spindle. Gears and racks cut from the solid and have all modern improvements, are made by special machinery, and sold very low.

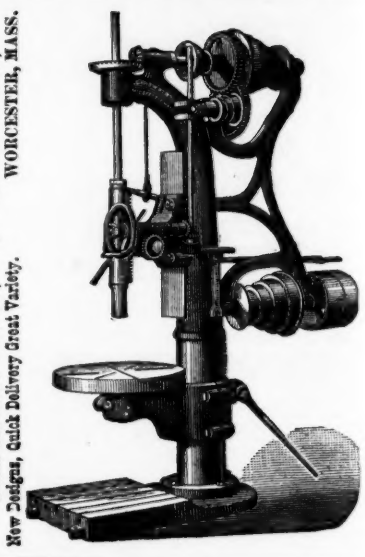
Our Key Seating Machine will save enough in 60 days' use to pay first cost; no shop can afford to do without one. We have now ready for prompt shipment, both Key Seat Machines and 20 in. Drills. Send for Photo. and Catalogue.

W. P. DAVIS, North Bloomfield, N.Y.

Engine Lathes, Planers, Drills, &c.

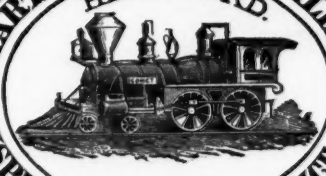
Pond Machine Tool Co., Successors to David W. Pond, WORCESTER, MASS.

New Designs, Quick Delivery Great Variety.



HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO.

HARTFORD, CONN.



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For New Reduced PRICE LIST, Write to

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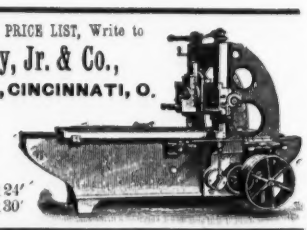
42 E. 8th ST., CINCINNATI, O.

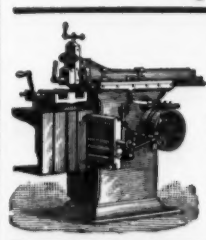
LATHES, 17 in. 20 in.

PLANERS, 24″x24″ 30″x30″



THE BUFFALO STEEL FOUNDRY, BUFFALO, N. Y.

ORDERS AND CORRESPONDENCE SOLICITED. | PRATT & LETCHWORTH Proprietors.



THIS SHAPER HAS 26-INCH STROKE.

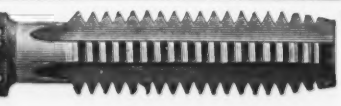
All the adjustments are made without operator moving from his position. It is made to act as a SLOTTING MACHINE, and is so arranged that KEY SEATS may be cut in any part of a shaft of any length, and from 4 inches in diameter down, and will plane a block 26″x26″x20″. Has SWIVEL GRADUATED VISE, two changes of speed, and is geared 36 to 1. It is very heavy and powerful, and is guaranteed to give perfect satisfaction.

Manufactured by LODGE, DAVIS & CO., CINCINNATI, OHIO.

(SUCCESSORS TO LODGE, BARKER & CO.)

Manufacturers of Iron and Brass-Working Machinery.

J.M. CARPENTER PAWTUCKET, R.I.



Manufacturer of TAPS AND DIES